WASTE MANAGEMENT

KELLY RUN SANITATION, INC. LANDFILL
FORWARD TOWNSHIP, ALLEGHENY COUNTY
PENNSYLVANIA
PADEP I.D. NO. 100663

QUARTERLY REPORTING REQUIREMENTS

FOURTH QUARTER 2010

Submitted:
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1.0 INTRODUCTION

1.1 SCOPE AND PURPOSE

This report summarizes the results of the 4th Quarter 2010 groundwater monitoring activities at Kelly Run Sanitation, Inc. Landfill (KRS). This work was conducted on November 15 – 23, 2010 to satisfy requirements of the Pennsylvania Department of Environmental Protection (PADEP). KRS operates a municipal waste landfill (Permit I.D. No. 100663) in Forward Township, Allegheny County.

KRS has been operating since 1965 and consists of five disposal units (Figures 1, 2, and 3):

- 17-acre pre-RCRA disposal area identified as the Old Waste Area (OWA) has been closed since early 1970s and was capped in 1997;
- A 9.0-acre Phase I Area closed municipal waste landfill, that was capped in 1996 (operating permit issued March 14, 1991);
- A 24.3-acre Phase II Area closed municipal waste landfill, that was capped in 1998 (operating permit issued January 18, 1995);
- A Phase III Area active municipal waste landfill (operating permit issued February 6, 1997); and
- The 35.0-acre Western Disposal Area (WDA), a closed and capped hazardous waste landfill (Hazardous Waste Postclosure Permit U.S. Environmental Protection Agency ID No. PAD004810222).

The Groundwater Monitoring Program at KRS incorporates permanent monitoring elements to provide environmental protection during and after landfill development. Field work, sampling methodologies, data evaluation, data QA/QC, and chemical analyses were conducted in accordance with the approved site permits.

1.2 SITE DESCRIPTION AND BACKGROUND

KRS currently receives municipal waste at a rate of about 8,000 tons per month. The facility consists of a 408-acre parcel, of which 48 acres are currently approved for active waste disposal. KRS is permitted to take municipal solid waste and other approved special wastes.

The WDA consists of approximately 35 acres and is a closed hazardous waste disposal landfill. The WDA was constructed with an engineered clay liner and leachate collection system (i.e., interceptor drain) and was capped with a very low density polyethylene (VLDPE) geomembrane in the early 1990s. The 17-acre OWA is a natural attenuation landfill that was capped in 1997. Phase I (9.0 acres) and Phase II (24.3 acres) landfill areas were constructed as lined landfills and were completely capped and closed in 1998. Both Phase I and Phase II have leachate detection zones. The Phase III area is a 48-acre permitted double-lined landfill with a leachate detection zone. The Phase III landfill is the only active waste placement area at the landfill and receives approximately 280 tons per day of solid waste.

2.0 GEOLOGY AND HYDROGEOLOGY

2.1 REGIONAL GEOLOGY

KRS is located within the Appalachian Physiographic Province (Heath, 1984). This province is characterized by relatively deeply incised valleys and low rolling hills. KRS is constructed within the head of a relatively deeply incised valley and upon the adjacent ridge to the south. The surficial bedrock geology of KRS consists of Paleozoic deposits of the Monongahela and Conemaugh Groups. No Quaternary sedimentary deposits exist at the site. The entire site area has been deep-mined for the Pittsburgh Coal.

2.2 LOCAL GEOLOGY

The Pennsylvanian-aged Monongahela Group is defined as the interval between the base of the Waynesburg Coal and the base of the Pittsburgh Coal. The Monongahela has an average thickness of 350 feet in this portion of southwestern Pennsylvania and consists of five units, from stratigraphically lowest to highest: Pittsburgh, Redstone, Sewickley, Uniontown, and Waynesburg. The Pittsburgh Formation consists of approximately 100 feet of coal, shale, limestone, and sandstone and is conformably overlain by the Redstone Formation. The Redstone is approximately 80 feet thick and includes the interval between the Redstone Limestone and the base of the Sewickley Coal. The Redstone Coal is approximately 2 to 4 feet thick and the Pittsburgh Coal seam is 8 to 9 feet thick.

2.2.1 Uniontown Formation

The Uniontown Formation, the uppermost unit exposed at KRS, consists of 50 to 90 feet of interbedded shale, claystone, limestone, and sandstone. Only 20 feet of the Upper Member of the Uniontown is exposed on the adjacent hilltops. The Lower Member of the Uniontown Formation rests conformably beneath the Upper Member. In this area, the Lower Member is approximately 30 to 35 feet thick. The basal unit of the Lower Member is the Uniontown Coal, which is usually represented by 12 to 18 inches of carbonaceous shale. The lithologic units above the Uniontown Coal are comprised of

interbedded sandstone and shale through the lower and middle parts of the member and interbedded calcareous shale and argillaceous limestones in the upper part. Both the Upper Member and the Lower Member are moderately to severely weathered in outcrops exposed by earth moving activities at the site.

2.2.2 Pittsburgh Formation

The Pittsburgh Formation is located stratigraphically between the Uniontown Coal at the top and the base of the Pittsburgh Coal. This formation has a thickness of about 255 feet at the site. The Pittsburgh Formation consists of five members, from stratigraphically highest to lowest: Upper Member, Sewickley Member, Fishpot Member, Redstone Member, and the Lower Member.

2.2.2.1 Upper Member - The Upper Member extends from the bottom of the Uniontown Coal to the top of the Benwood Limestone Bed in the Sewickley Member. The Upper Member is in the range of 80 to 90 feet thick at the site and is comprised of interbedded shale, claystone, and argillaceous limestone. Many of the shale and claystone beds are calcareous. There are four persistent limestone beds in the Upper Member that are identified from stratigraphically highest to lowest as Limestone D, Limestone C, Limestone B, and Limestone A (Dodge, 1985 and Johnson, 1929). These limestone beds were considered part of the Benwood Limestone in older geologic literature, but they have been divided into individual beds in the Upper Member in recent geologic information. The four limestone beds range in thickness from about 1-foot to as much as 10 feet thick, although where the limestone beds are thicker than about 2 feet, they commonly have thin interbedded shale or claystone partings several inches thick.

2.2.2.2 Sewickley Member - The Sewickley Member extends from the top of the Benwood Limestone at the top of the Sewickley Member to the base of the Sewickley Coal at the base of this member. In the Phase III landfill area and adjacent areas, the Sewickley Member is 50 to 60 feet thick. The Benwood, which is the dominant unit in this member, is comprised of interbedded argillaceous limestone, shale, claystone, and fine-grained sandstone beds. Individual limestone beds can be 5 to 6 feet thick, but are

typically about 2 feet thick. Calcareous shale, claystone, and fine-grained sandstone beds separate the limestone beds. The bottom 5 to 10 feet of the member is comprised of shale and includes the Sewickley Coal bed, which in this area is a carbonaceous shale bed up to 4 feet thick.

2.2.2.3 Fishpot Member - The Fishpot Member of the Monongahela Group occupies the interval from the bottom of the Sewickley Coal at the top to the top of a limestone bed, which is the uppermost bed in the underlying Redstone Member. The Fishpot Member has an average thickness of 20 feet at the site and is comprised of sandstone, limestone, and shale.

2.2.2.4 Redstone Member - The Redstone Member occupies the interval from the top of the limestone bed mentioned above to the bottom of the Redstone Coal. This member has a thickness in the range of 30 to 35 feet and is comprised of an argillaceous limestone bed in the upper 5 feet and is underlain by shale with some thin interbedded sandstone units. The Redstone Coal horizon, which is the basal unit of the member, varies in thickness from 2 to 4 feet thick within the area.

2.2.2.5 Lower Member - The Lower Member of the Monongahela Group occupies the interval from the bottom of the Redstone Coal at the top of the Member to the bottom of the Pittsburgh Coal at the base of the Member. The Lower Member is 70 to 80 feet thick and is comprised predominantly of shale and claystone. The Pittsburgh Coal, the basal unit in this Member, has been deep-mined under the entire site area. The coal has a thickness of 8 to 9 feet in the vicinity of the site. Mine maps for the underground mine workings indicate that the coal was mined by the complete retreat method after room-and-pillar mining (DEI, 1996a).

2.2.3 Conemaugh Group

Underlying the Monongahela Group is the Conemaugh Group. This group of rocks has a thickness of 550 to 600 feet in the western Pennsylvania area and is comprised of interbedded sandstone, shale, and claystone units with thin limestone beds and thin coal

beds that are not economically important resources. The Conemaugh Group lies below drainage in the area.

2.3 STRUCTURAL GEOLOGY

The Appalachian Physiographic Province is characterized by a series of low amplitude, symmetrical, and subparallel anticlines and synclines. Regionally, these fold axes trend roughly north/northeast-south/southwest. KRS is located on the east limb of the Roaring Run (Murrysville) Anticline and strata at the site generally strike N80° E and dip 2° SE.

2.4 SITE HYDROGEOLOGY

The monitoring well network targets the water-bearing zones where any potential impact would be observed at the earliest possible time. Two aquifers have been identified at KRS: the Benwood Limestone and the Pittsburgh Coal. Vertical gradients between the aquifers are generally downward (DEI, 1995).

2.4.1 Benwood Limestone Hydrostratigraphic Unit

Groundwater occurs under perched conditions within the Benwood Limestone (DEI, 1996a). Published reports indicate that the Benwood Limestone is a poor producer of groundwater in southern Allegheny County (Piper, 1933). Piper (1933) indicates that in this area the yields from the Benwood Limestone are small and erratic and a considerable proportion of wells completed into this unit are unsuccessful.

Groundwater flow direction is dictated by the gentle southeastward dip that occurs throughout the site area. The horizontal gradient is 0.0084 ft/ft (measured November 15 – 16, 2010; calculated from MW-302 to MW-311) (Figure 2). Discharge from the Benwood Limestone Hydrostratigraphic unit is primarily to springs in the site area and local surface water bodies. The unnamed tributary to Fallen Timber Run is the principal receiving stream downgradient of the site.

Groundwater within the Benwood occurs as a result of secondary porosity caused by joint and fracture planes occurring within the rock. Primary porosity occurring with the Benwood appears to be negligible (DEI, 1996a). Groundwater within the Benwood occurs at the base of this unit, and downward vertical flow is restricted by the underlying carbonaceous shale of the Sewickley Coal horizon. Constant-rate pumping tests indicate that the measured hydraulic conductivity is approximately 1.14 x 10^{-3} cm/sec (3.23 ft/day) and calculated porosity is 10 percent (DEI, 1996a).

Wells drilled through the Benwood and completed in the Pittsburgh Coal are characterized by not having encountered groundwater. DEI (1996a and 1996b) noted that groundwater flow does not occur between the Benwood and the Pittsburgh Coal and the geochemical fingerprints for these individual hydrostratigraphic units are different.

Groundwater within the Benwood is classified as a calcium-magnesium bicarbonate type of water. However, groundwater sampled from wells located south (downgradient) of the WDA [reported from Benwood monitoring wells MW-302, MW-303 (redrilled as MW-303R), MW-305 (decommissioned), MW-306 (decommissioned), and MW-307] are dominant in sodium, chloride, or both sodium and chloride (DEI, 1996a).

2.4.2 Pittsburgh Coal Hydrostratigraphic Unit

The Pittsburgh Coal Hydrostratigraphic Unit consists of the remnant mine workings, voids, and stumps in the retreat-mined Pittsburgh Coal. Piper (1933) concluded from mining observations that the Pittsburgh Coal in this area is not generally a water-bearing unit. Groundwater quality in the Pittsburgh Coal is generally degraded due to the presence of elevated levels of metals and sulfate. DEI (1996b) reported that groundwater within the Pittsburgh Coal is, in general, a non-dominant cation sulfate type of water.

Groundwater in the Pittsburgh Coal occurs under unconfined conditions (DEI, 1996b). A mine pool probably exists downgradient of the landfill. Groundwater recovered from the generally dry Pittsburgh Coal groundwater monitoring wells shows an acid-mine drainage characteristic (i.e., elevated concentrations of sulfate, iron, magnesium,

aluminum). Further, springs issuing from the Pittsburgh Coal 1 to 2 miles downgradient of the landfill show no influence related to leachate indicator parameters, but do show elevated acid-mine drainage constituents (DEI, 1996b). Consequently, DEI (1996b) concluded that the Benwood aquifer is not draining to the Pittsburgh Coal.

The Pittsburgh Coal unit occurs approximately 210 feet below the base of the active landfill (double-lined Phase III area). The Pittsburgh Coal has a measured hydraulic conductivity of 7.42×10^{-4} cm/sec (2.103 ft/day) (DEI, 1996b). Groundwater flow in this unit is structurally controlled and generally follows dip slope to the south-southeast (Figure 3). The Pittsburgh Coal has a measured horizontal hydraulic gradient (measured November 15 – 16, 2010; calculated from MW-201R to MW-211R1) to the south of 0.008 ft/ft. The effective porosity of the Pittsburgh Coal is estimated at 10 percent (DEI, 1996b).

3.0 FIELD PROGRAM, MONITORING RESULTS, AND DISCUSSION

3.1 VISUAL INSPECTION PROGRAM

The visual inspection program was implemented at KRS to aid in the early detection of a potential release. The visual inspection program performed by the sampling team includes physical examination of any stresses in biological communities, unexplained changes in soil characteristics, visible signs of leachate migration (i.e., leachate seeps), potential water table mounding beneath the waste management unit, and any other change to the environment due to the waste management unit.

3.2 WELL NETWORK AND GROUNDWATER ELEVATION MEASUREMENTS

3.2.1 Well Network

Based on the August 14, 2006 revision to the WDA post-closure care permit, the groundwater detection monitoring program for the WDA and municipal waste landfills at KRS consists of 21 groundwater monitoring wells that monitor 2 groundwater units. Each monitoring well network targets the preferential flowpath for the facility.

Detection Monitor Well Network

Monitored Zone	Upgradient Wells	Downgradient Wells
Benwood Limestone (Leachate Pond 3/4)	MW-301R	MW-302, MW-303R, MW-304, MW-307D, MW-310D, MW-310R, MW-311, MW-312R, MWPZ-1, MWPZ-2, MWPZ-3
Pittsburgh Coal	MW-201R	MW-204, MW-211R1
Lower Leachate Pond (Pittsburgh Coal)	MW-P1U	MW-P1D1R, MW-P1D2
Upper Leachate Pond (Pittsburgh Coal)	MW-P2U	MW-P2D1, MW-P2D2

3.2.2 Groundwater Elevation Measurements

Prior to initiation of groundwater purging and sampling activities, depth to water and water level elevation (feet above mean sea level) were recorded to the nearest hundredth of a foot. Water levels were collected from a total of 19 monitoring wells (MW-303R is a groundwater recovery well, and MW-P2U reference elevation is not available). The water level measurements are utilized in preparation of groundwater contour maps to determine groundwater flow direction and gradient at the site.

Water level data were collected from November 15 – 16, 2010 using an electronic water level meter. Depth to groundwater was measured in each well and converted to elevations in feet above mean sea level (Table 2). Groundwater elevations for the 4th Quarter 2010 sampling event are generally comparable to historical groundwater elevation measurements.

Using water levels measured on November 15 – 16, 2010, potentiometric surface maps were prepared that depict a plan view of horizontal groundwater flow (Figures 2 and 3). Groundwater within the Benwood Hydrostratigraphic Unit generally flows to the south and southeast (Figure 2). Groundwater within the Pittsburgh Coal Hydrostratigraphic Unit generally flows to the south-southeast (Figure 3).

3.3 GROUNDWATER GRADIENT AND FLOW VELOCITY

The horizontal groundwater seepage velocity downgradient of the landfill was estimated using the following equation:

$$v = \frac{(K_h i)}{n_e}$$

Where:

v	= average groundwater velocity;
K_h	= aquifer horizontal conductivity;
i	= average hydraulic gradient; and
n_e	= effective aquifer porosity (Freeze and Cherry, 1979).

The potentiometric surface map (November 15 – 16, 2010) of the Benwood Hydrostratigraphic Unit indicates that groundwater flow in this unit is from northwest to southeast with a horizontal gradient of 8.4×10^{-3} ft/ft (Figure 2). The average horizontal velocity of the Benwood Hydrostratigraphic Unit is 2.71×10^{-1} ft/day (98.9 ft/year), based upon an average hydraulic conductivity of 1.14×10^{-3} cm/sec (3.23 ft/day) (DEI, 1996a) and effective porosity of 10 percent (DEI, 1996a).

The potentiometric surface map (November 15 – 16, 2010) of the Pittsburgh Coal Hydrostratigraphic Unit indicates that groundwater flow in this unit is from north-northwest to south-southeast with a horizontal gradient of 8.0×10^{-3} ft/ft (Figure 3). The average horizontal groundwater velocity of the Pittsburgh Coal Hydrostratigraphic Unit is 1.68×10^{-1} ft/day (61 ft/year), based upon an average hydraulic conductivity of 7.42×10^{-4} cm/sec (2.103 ft/day) (DEI, 1996b) and effective porosity of 10 percent (DEI, 1996b).

3.4 SAMPLING AND ANALYTICAL PROGRAM

3.4.1 Field Program

Field sampling activities for the groundwater monitoring wells for the 4th Quarter 2010 were conducted November 15 – 23, 2010 (Tables 1 and 2). Monitoring well purging and sampling activities were implemented in accordance with the site's Groundwater Sampling and Analysis Plan and site permit. Wells were purged and sampled using dedicated pump systems or hand bailers (Appendix C).

3.4.2 Laboratory Analysis and Monitoring Parameters

As described in the municipal site's Groundwater Sampling and Analysis Plan (CE Consultants, 1995) and the WDA's Groundwater Monitoring and Reporting Plan (MFG, Inc., 2003), the KRS Landfill monitoring list was selected based on an evaluation of site-specific information including background groundwater chemistry, leachate analytical results, and chemical detectability, mobility, and persistence. Monitoring wells at the site are analyzed for PADEP Form 19 constituents and additional parameters at select wells in accordance with the recently revised (August 14, 2006) post-closure permit for the WDA.

DETECTION MONITORING
PADEP FORM 19 QUARTERLY CONSTITUENTS

INORGANIC AND GENERAL CHEMISTRY

Alkalinity, total*	Iron	Sodium*
Ammonia-nitrogen*	Magnesium*	Sulfate*
Bicarbonate (as $CaCO_3$)*	Manganese*	Total Organic Carbon*
Calcium*	Nitrate-Nitrogen	Total Dissolved Solids*
Chemical Oxygen Demand*	pH, Field & Laboratory*	Total Phenolics
Chloride*	Potassium*	Turbidity
Fluoride	Specific conductance,	
	Field & Laboratory*	* Indicator analyte

ORGANIC CHEMISTRY

Benzene	*cis*-1,2-Dichloroethene	Toluene
1,2-Dibromoethane	*trans*-1,2-Dichloroethene	1,1,1-Trichloroethane
1,1-Dichloroethane	Ethyl benzene	Trichloroethene
1,1-Dichloroethene	Methyl chloride	Vinyl chloride
1,2-Dichloroethane	Tetrachloroethene	Xylene

ADDITIONAL CONSTITUENTS FOR:
MW-201, MW-204, MW-211R1, MW-P2U, MW-301R, MW-302R, MW-303R, MW-304, MW-307, MW-310R, MW-311D, AND MW-312R

QUARTERLY PARAMETERS	ANNUAL PARAMETERS
Total Organic Halogen	Lead
Chromium	Arsenic
Naphthalene	Aluminum
Creosote	Cyanide

ADDITIONAL CONSTITUENTS FOR:
MW-PZ-1, MW-PZ-2, AND MW-PZ-3

QUARTERLY PARAMETER	SEMI-ANNUAL PARAMETER
Total Organic Halogen	Naphthalene

All water samples collected at the site were delivered to Geochemical Testing, Inc. in Somerset, PA for chemical analysis. Geochemical Testing is certified in the Commonwealth of Pennsylvania for performing chemical analysis of the reported parameters. Original laboratory reports detail specific reporting limits (Appendices A, B, and C).

3.5 ANALYTICAL PROGRAM RESULTS

The 4th Quarter 2010 sampling event was performed November 15 – 23, 2010. Ten wells were sampled for Form 19 parameters. Eleven wells were sampled for WDA Post-Closure parameters. Additional constituents were analyzed for several Benwood Limestone and Pittsburgh Coal monitoring wells. One field duplicate, one field blank, and two trip blanks were also collected.

3.6 GEOCHEMICAL ANALYSIS

KRS submits a quarterly report that discusses groundwater quality from all of the monitoring wells specified in the PADEP approved permit. The permit requires quarterly sampling for Form 19 parameters and time-series evaluation of leachate indicator parameters. The time versus concentration plots were analyzed for significant trends of a given constituent, unexpected geochemical signatures, and anomalously high results.

3.6.1 Volatile Organic Compounds

The Benwood Limestone Hydrostratigraphic Unit has been shown to contain BTEX and naphthalene through several assessment reports (DEI, 1996a) and remediation of the aquifer was also addressed in a 1996 Consent Order and the August 14, 2006 WDA Permit. Further, Benwood Limestone groundwater monitoring well MW-303R is a recovery well that has operated as part of the remediation of the groundwater since 1996.

Several volatile organic compounds have historically been detected in Benwood Limestone groundwater monitoring wells. For the 4th Quarter 2010 sampling event, benzene was detected in MW-302R (35.1 μg/L) and MW-303R (10 μg/L). Concentrations for each of the detections are within historical levels for each monitoring point. Volatile organic compounds were not detected above established reporting limits in any other wells.

3.6.2 Time-Series Analysis

The time versus concentration plots of five leachate indicator parameters (ammonia nitrogen, alkalinity, total dissolved solids, chloride, and sodium) were analyzed for significant trends, unexpected geochemical signatures, and anomalously high results.

3.6.2.1 Benwood - As shown on the time-series chart (Figure 4), no significant upward trend in the concentration of any indicator parameter was noted for the Benwood Hydrostratigraphic Unit. Geochemical analyses show that groundwater from the Benwood is a calcium bicarbonate (MW-304) to a sodium chloride (MW-311 and MW-312) dominant water type which is roughly consistent with that observed from previous studies (e.g., DEI, 1996a) (1st Quarter 2010: Figures 7 and 8).

3.6.2.2 Pittsburgh Coal - As shown on the time-series chart (Figure 5), no significant upward trend in the concentration of any indicator parameter was noted for the Pittsburgh Coal Hydrostratigraphic Unit except ammonia nitrogen, alkalinity, and sodium at MW-211R1, and alkalinity, chloride, and sodium at MW-204. However, concentrations for alkalinity, chloride, and sodium at MW-204, and all five leachate indicator parameters at MW-211R1 appear to fluctuate seasonally. In addition, since the concentrations of sodium, chloride, and total dissolved solids are higher at MW-211R1 than that of leachate, trends observed at this monitoring well do not appear to be the result of a leachate influence. Groundwater from the Pittsburgh Coal can generally be characterized as a calcium bicarbonate (MW-204) to sodium chloride (MW-211R1) water type (1st Quarter 2010: Figures 9 and 10). Monitoring point MW-201R was dry during the 4th Quarter 2010 sampling event.

3.6.2.3 Leachate Pond Wells - No significant upward trend in the concentration of any indicator parameter was noted for the Pittsburgh Coal Hydrostratigraphic Unit in the lower and upper leachate pond areas except a slight increasing trend for total dissolved solids at MW-P2U (Figure 6). However, groundwater chemistry at MW-P2U differs from leachate, and groundwater from this portion of the Pittsburgh Coal characterizes, in general, as a calcium-bicarbonate to calcium-sulfate type of water (1st Quarter 2010: Figures 11 and 12).

3.6.2.4 Lysimeters - Two lysimeter sets (ML-1A and ML-2A) are located beneath the first two stages of the Phase III Area and are monitored for the presence of water. No water was detected in these lysimeters for the 4th Quarter 2010 sampling event indicating that the liner system is not leaking into the subsurface (Table 1).

3.6.3 Surface Water Analysis

Six surface water samples (KR-2, FTR-2, ST-2, ST-3, ST-5, and SP-3) were collected November 15, 2010 for Form 19 analysis (SP-4 was dry) in accordance with the revised Groundwater Monitoring and Reporting Plan approved with the August 14, 2006 WDA Permit. The SP-series surface water points monitor the Benwood which crops out along the southern portion of the landfill. Surface water points ST-2 and FTR-2 monitor Fallen Timber Run. Surface water point KR-2 monitors an unnamed tributary to Fallen Timber Run. Surface point ST-3 monitors an unnamed tributary upstream of ST-2, and ST-5 is upgradient of ST-3 on the unnamed tributary to Fallen Timber Run.

Analyses were generally consistent with the historical data for these monitoring points. Volatile organic compounds were not detected in any surface water samples for the 4th Quarter 2010.

4.0 LABORATORY AND FIELD QUALITY ASSURANCE AND QUALITY CONTROL

4.1 TRIP, FIELD, AND EQUIPMENT BLANKS

Two trip blanks, one field blank, and one duplicate sample were collected as part of the field sampling and analysis quality control/quality assurance activities. The field blank and trip blanks did not detect any constituents that would place the sampling event into question.

4.2 HOLDING TIMES

All samples submitted to Geochemical Testing were analyzed within the required holding times as determined by the analytical method.

4.3 SAMPLE SURROGATE RECOVERIES

Sample recovery analyses are performed with each quarterly event and reported annually with the first quarter event. However, if results are not within acceptable ranges, notification would be included in the Quality Assurance Project Report prepared by Geochemical Testing (Appendix C).

4.4 METHOD BLANKS

No laboratory method blanks contained detectable concentrations of any constituents that would place the laboratory analyses into question (Appendix C).

4.5 LABORATORY CONTROL SPIKES

Laboratory control spikes for all analytical methods are performed with each quarterly event and reported annually with the first quarter event. However, if results are not within advisory limits, notification would be included in the Quality Assurance Project Report prepared by Geochemical Testing (Appendix C).

4.6 INITIAL CALIBRATION, CONTINUING CALIBRATION, AND INTERNAL MACHINE STANDARDS

Laboratory calibration is performed with each quarterly event and reported annually with the first quarter event. However, if results are not within acceptable limits, notification would be included in the Quality Assurance Project Report prepared by Geochemical Testing (Appendix C).

4.7 DUPLICATE SAMPLES

Duplicate sample analysis results were generally consistent with the corresponding original sample results.

5.0 CONCLUSIONS

Samples were collected at KRS according to appropriate sampling procedures for Form 19 and Form 50 parameters and sent to Geochemical Testing in Somerset, PA. The following observations are noted for the 4th Quarter 2010 sampling event:

- The active and closed areas of KRS are underlain by two monitored hydrostratigraphic units: Benwood Limestone and the Pittsburgh Coal.
- KRS was sampled for Form 19 groundwater and surface water constituents on November 15 – 23, 2010.
- Several Benwood groundwater monitoring points were sampled for additional parameters in accordance with the August 14, 2006 WDA Permit.
- KRS leachate was sampled for Form 50 constituents on November 15, 2010.
- The Benwood Limestone Hydrostratigraphic Unit has a horizontal gradient to the south of 8.4×10^{-3} ft/ft, with a velocity of 0.271 ft/day (98.9 ft/year) (Figure 2).
- The Pittsburgh Coal Hydrostratigraphic Unit has a horizontal gradient to the south of 8.0×10^{-3} ft/ft, with a velocity of 0.168 ft/day (61 ft/year) (Figure 3).
- Volatile organic compounds were detected in Benwood Limestone groundwater monitoring wells MW-302R and MW-303R. Volatile organic compounds were not detected above established reporting limits in other surface water or in other groundwater monitoring wells.
- Time-series analyses indicate that there are no increasing trends in the leachate indicator parameters in groundwater at Kelly Run Landfill except for alkalinity, chloride, and sodium at MW-204; ammonia nitrogen, alkalinity, and sodium at MW-211R1; and a slight increasing trend for total dissolved solids at MW-P2U. However, these rises do not appear to be the result of a leachate influence.

Based on a review of recent and historical data collected during routine monitoring events at KRS, the following observations are made:

- Groundwater elevation contour maps show that local groundwater gradient and velocity have been temporally consistent in both monitored groundwater units.
- Concentrations of trace metals and other inorganic constituents in groundwater samples were generally consistent with historical concentrations.
- Surface water analyses of metals and inorganic parameter concentrations are generally consistent with historical concentrations (Appendix B). The Benwood Spring continues to be collected and treated as leachate due to historical detections of volatile organic compounds.
- The Benwood Limestone Hydrostratigraphic Unit has been shown to historically contain BTEX and naphthalene through several assessment reports (DEI, 1996a) and remediation of the aquifer was also addressed in a 1996 Consent Order and the August 14, 2006 WDA Permit. Benwood groundwater monitoring well MW-303R is a recovery well that has operated as part of Kelly Run's groundwater remediation efforts since 1996.

Therefore, the major conclusions of this report are:

1. Continued landfilling activities do not appear to be altering the existing groundwater conditions.
2. The groundwater monitoring network is capable of monitoring the Benwood and Pittsburgh Coal Hydrostratigraphic units.
3. The frequency of sampling and the constituents analyzed are appropriate for determining if a release has occurred.

6.0 REFERENCES

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TABLE 1

KELLY RUN LANDFILL
PADEP I.D. NO. 100663

FOURTH QUARTER 2010
FIELD PARAMETERS

AQUIFER	MONITORING POINT	SAMPLE DATE	SAMPLE TIME	WATER LEVEL[1] (ft)	WELL DEPTH[1] (ft)	WATER VOLUME[2] (gallons)	THREE VOLUMES (gallons)	WATER PURGED (gallons)	VOLUMES PURGED	FIELD PARAMETERS			COMMENTS
										pH	COND (µS/m)	TEMP (C)	
Benwood Limestone	MW-301R	11/15/2010	DRY	134.20	135.85	1.07	3.22						Insufficient Water to Sample
	MW-302R	11/16/2010	11:25 AM	150.20	170.26	13.04	39.12	1.00	0.08	6.30	4586	13.3	
	MW-303R	11/23/2010	01:15 PM	NP	63.20	NP	NP	NP	NP	NP	NP	NP	
	MW-304	11/15/2010	12:20 PM	50.00	64.15	9.20	27.59	1.50	0.16	6.67	1248	12.5	
	MW-307D	11/15/2010	03:20 PM	157.90	168.20	6.69	20.09	2.50	0.37	6.73	3608	13.2	
	MW-310D	11/15/2010	DRY	DRY	128.84								Insufficient Water to Sample
	MW-310R	11/15/2010	DRY	DRY	108.81								Insufficient Water to Sample
	MW-311	11/16/2010	12:50 PM	104.40	116.85	8.09	24.28	0.80	0.10	7.49	7819	12.1	
	MW-312R	11/16/2010	12:10 PM	171.10	182.65	7.51	22.52	4.00	0.53	6.47	6598	12.0	
	PZ-1	11/15/2010	10:30 AM	101.50	119.32	11.58	34.75	2.50	0.22	7.48	2708	13.9	
	PZ-2	11/15/2010	10:55 AM	116.80	129.45	8.22	24.67	3.00	0.36	7.57	2807	13.4	
	PZ-3	11/15/2010	11:25 AM	104.00	111.08	4.60	13.81	1.50	0.33	6.87	2740	14.5	
Pittsburgh Coal	MW-201R	11/15/2010	DRY	274.00	276.44								Insufficient Water to Sample
	MW-204	11/15/2010	04:10 PM	296.80	310.00	8.58	25.74	3.00	0.35	7.01	3200	13.3	
	MW-211R1	11/15/2010	01:20 PM	194.60	196.92	1.51	4.52	1.80	1.19	6.47	7023	13.4	
Lower	MW-P1U	11/16/2010	10:45 AM	21.30	36.75	10.04	30.13	14.00	1.39	6.61	1535	13.1	
Leachate	MW-P1D1	11/16/2010	10:20 AM	30.00	38.82	5.73	17.20	2.50	0.44	6.85	1242	12.5	
Pond	MW-P1D2	11/16/2010	09:55 AM	28.00	42.12	9.18	27.53	3.00	0.33	6.42	1226	12.9	
Upper	MW-P2U	11/16/2010	DRY	DRY	92.34								Insufficient Water to Sample
Leachate	MW-P2D1	11/16/2010	02:45 PM	95.10	96.50	0.91	2.73	2.00	2.20	6.16	997	11.5	
Pond	MW-P2D2	11/16/2010	01:35 PM	95.40	98.61	2.09	6.26	2.00	0.96	6.54	1061	11.5	
Surface Water	KR-2	11/15/2010	12:30 PM							7.05	970	7.9	
	FTR-2	11/15/2010	11:55 AM							7.21	1520	10.2	
	ST-2	11/15/2010	11:45 AM							7.44	867	7.1	
	ST-3	11/15/2010	11:35 AM							7.72	1349	8.0	
	ST-5	11/15/2010	11:20 AM							7.40	1330	8.8	
	SP-3	11/15/2010	04:25 PM							6.95	1215	10.7	
	SP-4	11/15/2010	DRY										Dry
Leachate	PHASE 1	11/15/2010	10:45 AM							7.50	8352	18.3	
	PHASE 2	11/15/2010	10:35 AM							7.20	5518	15.5	
	PHASE 3	11/15/2010	03:15 PM							6.82	11170	15.1	
	WDA LEACH.	11/15/2010	10:15 AM							5.74	1471	19.0	
	PHASE 1 DZ	11/15/2010	10:55 AM							6.76	1477	14.7	
	PHASE 2 DZ	11/15/2010	10:25 AM							6.09	1537	19.2	
	PHASE 3A DZ	11/15/2001	02:30 PM							6.19	3718	12.9	
	PHASE 3B DZ	11/15/2010	03:35 PM							6.39	16770	14.8	
Phase III Subgrade	ML-1A	11/16/2010	DRY										Lysimeter is Dry
Monitoring Pt.	ML-2A	11/16/2010	DRY										Lysimeter is Dry

Notes:
[1] Measured from top of inner casing.
[2] Calculated from 0.65 gallons per foot of water
Sampled by Cody Salmon, Aquascape
ft = feet

C = Degrees Centigrade
µS/m = microSiemens/meter
gpm = gallons per minute
N/A = Not Applicable
NP = Not Provided

TABLE 2

KELLY RUN LANDFILL
PADEP I.D. NO. 100663

FOURTH QUARTER 2010
WATER-LEVEL ELEVATIONS

AQUIFER	MONITORING POINT	GRADIENT POSITION	MEASUREMENT DATE	MEASUREMENT POINT ELEV.[1] (ft amsl)	WATER LEVEL[2] (ft)	WATER LEVEL ELEV. (ft amsl)
Benwood Limestone	MW-301R	U	11/15/2010	1169.67	134.20	1035.47
	MW-302R	D	11/16/2010	1154.41	150.20	1004.21
	MW-303R[3]	D	11/15/2010	1653.57	NA	NA
	MW-304	D	11/15/2010	1055.14	50.00	1005.14
	MW-307D	D	11/15/2010	1165.07	157.90	1007.17
	MW-310D	D	11/15/2010	1099.42	DRY	DRY
	MW-310R	D	11/15/2010	1099.39	DRY	DRY
	MW-311	D	11/16/2010	1100.37	104.40	995.97
	MW-312R	D	11/16/2010	1171.46	171.10	1000.36
	PZ-1	D	11/15/2010	1119.32	101.50	1017.82
	PZ-2	D	11/15/2010	1135.94	116.80	1019.14
	PZ-3	D	11/15/2010	1124.39	104.00	1020.39
Pittsburgh Coal	MW-201R	U	11/15/2010	1158.13	274.00	884.13
	MW-204	D	11/15/2010	1163.25	296.80	866.45
	MW-211R1	D	11/15/2010	1064.00	194.60	869.40
Lower	MW-P1U	U	11/16/2010	892.73	21.30	871.43
Leachate	MW-P1D1	D	11/16/2010	891.18	30.00	861.18
Pond	MW-P1D2	D	11/16/2010	888.43	28.00	860.43
Upper	MW-P2U	U	11/16/2010	NA	DRY	DRY
Leachate	MW-P2D1	D	11/16/2010	963.17	95.10	868.07
Pond	MW-P2D2	D	11/16/2010	963.17	95.40	867.77

Notes:

[1] Elevation for the top of the PVC from well logs.
[2] Measured from the top of the 4" PVC riser pipe. Measured by Cody Salmon, Aquascape
[3] Groundwater Recovery Well

ft = foot
ft amsl = feet above mean sea level.
NA = Not Available
NM = Not Measured

TABLE 3

KELLY RUN SANITATION LANDFILL
PA DEP I.D. NO. 100663

FOURTH QUARTER 2010
RESULTS OF CHEMICAL ANALYSES PERFORMED ON GROUNDWATER AND SURFACE WATER

				GROUNDWATER										
Chemical Constituent	Unit	Analytical Method No.	MCL	MW-201R	MW-204	MW-211R1	MW-301R	MW-302R	MW-303R	MW-304	MW-307	MW-310	MW-310R	MW-311
Inorganics														
Ammonia Nitrogen	mg/L as N	EPA 350.1&D	NA	DRY	0.91	10.8	DRY			0.26		DRY	DRY	1.04
Bicarbonate	mg/L as CaCO3	SM 4500-CO2D	NA	DRY	1300	888	DRY			680		DRY	DRY	1130
Calcium	mg/L	EPA 200.7	NA	DRY	158	230	DRY			170		DRY	DRY	26.1
Chemical Oxygen Demand	mg/L	HACH 8000	NA	DRY	69	120	DRY			< 10		DRY	DRY	120
Chloride	mg/L	EPA 300.0	250*	DRY	394	1870	DRY	1400	25	5	510	DRY	DRY	2050
Fluoride	mg/L	EPA 300.0	4	DRY	0.9	0.3	DRY			< 0.1		DRY	DRY	0.8
Iron	mg/L	EPA 200.7	0.3*	DRY	42.6	35.5	DRY			0.06		DRY	DRY	1.16
Magnesium	mg/L	EPA 200.7	NA	DRY	44.2	95.3	DRY			87.5		DRY	DRY	14.8
Manganese	mg/L	EPA 200.7	0.05*	DRY	0.49	0.55	DRY			0.36		DRY	DRY	0.04
Nitrate Nitrogen	mg/L as N	EPA 300.0	10	DRY	< 0.05	0.53	DRY			0.09		DRY	DRY	1.28
pH, Field	su	FLD	NA	DRY	7.01	6.47	DRY	6.3		6.67	6.73	DRY	DRY	7.49
pH, Lab	su	SM4500-H+B	NA	DRY	7.97	7.16	DRY	6.97	6.95	7.19	7.29	DRY	DRY	7.91
Potassium	mg/L	EPA 200.7	NA	DRY	4.9	17.1	DRY			3.8		DRY	DRY	8.7
Sodium	mg/L	EPA 200.7	NA	DRY	799	1330	DRY			16.7		DRY	DRY	1660
Specific Conductance, Field	umhos/cm	FLD	NA	DRY	3200	7023	DRY	4586		1248	3608	DRY	DRY	7819
Specific Conductance, Lab	umhos/cm	EPA 120.1	NA	DRY	3360	7010	DRY	4720	1280	1230	3480	DRY	DRY	7880
Sulfate	mg/L	EPA 300.0	250*	DRY	23	39	DRY			109		DRY	DRY	< 10
Alkalinity to pH 4.5	mg/L as CaCO3	SM 18 2320B	NA	DRY	1310	889	DRY			681		DRY	DRY	1140
Total dissolved solids	mg/L	SM2540-C	NA	DRY	2000	3860	DRY			868		DRY	DRY	4460
Total Organic Carbon	mg/L	SM 18 5310-C	NA	DRY	16.5	30.3	DRY	44.1	4.4	2.5	24.9	DRY	DRY	26.3
Phenolics, total	ug/L	EPA 420.1	4000	DRY	< 20.0	< 20.0	DRY	83	< 20.0	< 20.0	< 20.0	DRY	DRY	< 20.0
Turbidity	NTU	EPA 180.1	NA	DRY	231	184	DRY			0.7		DRY	DRY	13.4
Organics														
Benzene	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	DRY	35.1	10	< 5.0	< 5.0	DRY	DRY	< 5.0
1,2-Dibromoethane	ug/L	EPA 8260B	0.05	DRY	< 5.0	< 5.0	DRY			< 5.0		DRY	DRY	< 5.0
1,1-Dichloroethane	ug/L	EPA 8260B	27	DRY	< 5.0	< 5.0	DRY			< 5.0		DRY	DRY	< 5.0
1,1-Dichloroethene	ug/L	EPA 8260B	7	DRY	< 5.0	< 5.0	DRY			< 5.0		DRY	DRY	< 5.0
1,2-Dichloroethane	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	DRY			< 5.0		DRY	DRY	< 5.0
cis-1,2-Dichloroethene	ug/L	EPA 8260B	70	DRY	< 5.0	< 5.0	DRY			< 5.0		DRY	DRY	< 5.0
trans-1,2-Dichloroethene	ug/L	EPA 8260B	100	DRY	< 5.0	< 5.0	DRY			< 5.0		DRY	DRY	< 5.0
Ethylbenzene	ug/L	EPA 8260B	700	DRY	< 5.0	< 5.0	DRY	< 5.0	< 5.0	< 5.0	< 5.0	DRY	DRY	< 5.0
Methylene Chloride	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	DRY			< 5.0		DRY	DRY	< 5.0
Tetrachloroethene	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	DRY			< 5.0		DRY	DRY	< 5.0
Toluene	ug/L	EPA 8260B	1000	DRY	< 5.0	< 5.0	DRY	< 5.0	< 5.0	< 5.0	< 5.0	DRY	DRY	< 5.0
1,1,1-Trichloroethane	ug/L	EPA 8260B	200	DRY	< 5.0	< 5.0	DRY			< 5.0		DRY	DRY	< 5.0
Trichloroethene	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	DRY			< 5.0		DRY	DRY	< 5.0
Vinyl Chloride	ug/L	EPA 8260B	2	DRY	< 2.0	< 2.0	DRY			< 2.0		DRY	DRY	< 2.0
Total Xylene	ug/L	EPA 8260B	10000	DRY	< 5.0	< 5.0	DRY	< 5.0	< 5.0	< 5.0	< 5.0	DRY	DRY	< 5.0
Additional Parameters														
Chromium	mg/L	EPA 200.7	0.10	DRY	0.02	< 0.01	DRY	0.06	< 0.01	< 0.01	< 0.01	DRY	DRY	< 0.01
Chromium, dissolved	mg/L	EPA 200.7D	0.10	DRY	< 0.01	< 0.01	DRY	< 0.01	< 0.01	< 0.01	< 0.01	DRY	DRY	< 0.01
Naphthalene	ug/L	EPA 8260B	100	DRY	< 5.0	< 5.0	DRY	< 5.0	< 5.0	< 5.0	< 5.0	DRY	DRY	< 5.0
Total Organic Halogen	ug/L	EPA 9020B	NA	DRY	144	177	DRY	677	28	< 20	264	DRY	DRY	332

MCL = Maximum Contaminant Level (EPA Federal Drinking Water Standards or Pennsylvania DEP Statewide Health Standards for used aquifers in a residential setting where EPA Standard does not exist)
* These values represent secondary MCLs.
Dry Points: MW-201R, MW-301R, MW-310, MW-310R, MW-P2U, SP-4

TABLE 3

KELLY RUN SANITATION LANDFILL
PA DEP I.D. NO. 100663

FOURTH QUARTER 2010
RESULTS OF CHEMICAL ANALYSES PERFORMED ON GROUNDWATER AND SURFACE WATER

Chemical Constituent	Unit	Analytical Method No.	MCL	GROUNDWATER									
				MW-312	MW-P1U	MW-P1D1	MW-P1D2	MW-P2U	MW-P2D1	MW-P2D2	MWPZ-1	MWPZ-2	MWPZ-3
Inorganics													
Ammonia Nitrogen	mg/L as N	EPA 350.1&D	NA	20.8	0.31	0.46	0.22	DRY	< 0.10	< 0.10			
Bicarbonate	mg/L as CaCO3	SM 4500-CO2D	NA	1010	563	488	472	DRY	264	240			
Calcium	mg/L	EPA 200.7	NA	192	168	165	138	DRY	126	145			
Chemical Oxygen Demand	mg/L	HACH 8000	NA	280	< 10	< 10	< 10	DRY	< 10	< 10			
Chloride	mg/L	EPA 300.0	250*	1730	64	79	97	DRY	49	43	142	156	171
Fluoride	mg/L	EPA 300.0	4	0.3	0.3	0.2	< 0.1	DRY	0.3	0.3			
Iron	mg/L	EPA 200.7	0.3*	1.42	0.3	1.79	< 0.05	DRY	< 0.05	0.06			
Magnesium	mg/L	EPA 200.7	NA	104	52	47.7	37.1	DRY	45.3	49			
Manganese	mg/L	EPA 200.7	0.05*	0.05	0.9	0.25	1.07	DRY	< 0.01	0.03			
Nitrate Nitrogen	mg/L as N	EPA 300.0	10	1.01	< 0.05	0.08	< 0.05	DRY	0.1	< 0.05			
pH, Field	su	FLD	NA	6.47	6.61	6.85	6.42	DRY	6.16	6.54	7.48	7.57	6.87
pH, Lab	su	SM4500-H+B	NA	7.49	7.29	7.45	7.23	DRY	6.87	7.22	7.97	8.03	7.32
Potassium	mg/L	EPA 200.7	NA	22.1	3.6	2.5	2.3	DRY	3.6	4.1			
Sodium	mg/L	EPA 200.7	NA	1160	153	71.6	115	DRY	42.4	38.5			
Specific Conductance, Field	umhos/cm	FLD	NA	6598	1535	1242	1226	DRY	997	1061	2708	2807	2740
Specific Conductance, Lab	umhos/cm	EPA 120.1	NA	6730	1500	1260	1240	DRY	956	1030	2590	2790	2550
Sulfate	mg/L	EPA 300.0	250*	< 10	264	158	115	DRY	229	317			
Alkalinity to pH 4.5	mg/L as CaCO3	SM 18 2320B	NA	1010	564	489	473	DRY	264	240			
Total dissolved solids	mg/L	SM2540-C	NA	3680	1010	816	764	DRY	646	722			
Total Organic Carbon	mg/L	SM 18 5310-C	NA	55.5	2.4	2.5	3.7	DRY	1.6	1.5	6.6	6.7	11.6
Phenolics, total	ug/L	EPA 420.1	4000	< 20.0	< 20.0	< 20.0	< 20.0	DRY	< 20.0	< 20.0			
Turbidity	NTU	EPA 180.1	NA	21.6	9.3	21.7	0.5	DRY	0.3	0.3			
Organics													
Benzene	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
1,2-Dibromoethane	ug/L	EPA 8260B	0.05	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
1,1-Dichloroethane	ug/L	EPA 8260B	27	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
1,1-Dichloroethene	ug/L	EPA 8260B	7	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
1,2-Dichloroethane	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
cis-1,2-Dichloroethene	ug/L	EPA 8260B	70	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
trans-1,2-Dichloroethene	ug/L	EPA 8260B	100	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
Ethylbenzene	ug/L	EPA 8260B	700	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
Methylene Chloride	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
Tetrachloroethene	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
Toluene	ug/L	EPA 8260B	1000	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
1,1,1-Trichloroethane	ug/L	EPA 8260B	200	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
Trichloroethene	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
Vinyl Chloride	ug/L	EPA 8260B	2	< 2.0	< 2.0	< 2.0	< 2.0	DRY	< 2.0	< 2.0			
Total Xylene	ug/L	EPA 8260B	10000	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
Additional Parameters													
Chromium	mg/L	EPA 200.7	0.10	< 0.01				DRY					
Chromium, dissolved	mg/L	EPA 200.7D	0.10	< 0.01				DRY					
Naphthalene	ug/L	EPA 8260B	100	< 5.0				DRY					
Total Organic Halogen	ug/L	EPA 9020B	NA	420				DRY			35	57	112

MCL = Maximum Contaminant Level (EPA Federal Drinking Water Standards or Pennsylvania DEP Statewide Health Standards for used aquifers in a residential setting where EPA Standard does not exist)
* These values represent secondary MCLs.
Dry Points: MW-201R, MW-301R, MW-310, MW-310R, MW-P2U, SP-4

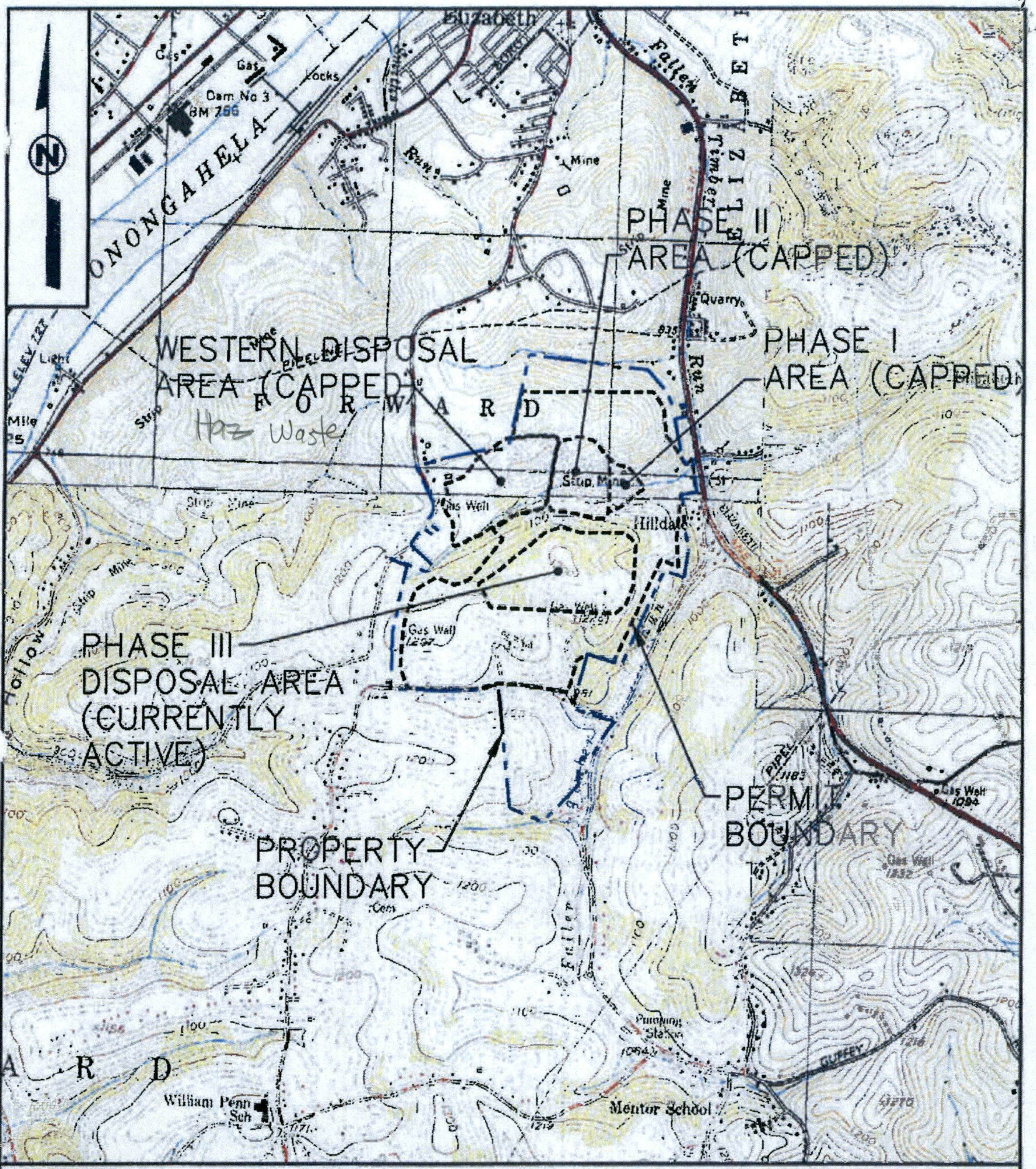
TABLE 3

KELLY RUN SANITATION LANDFILL
PA DEP I.D. NO. 100663

FOURTH QUARTER 2010
RESULTS OF CHEMICAL ANALYSES PERFORMED ON GROUNDWATER AND SURFACE WATER

				SURFACE WATER						
Chemical Constituent	Unit	Analytical Method No.	MCL	KR-2	FTR-2	ST-2	ST-3	ST-5	SP-3	SP-4
Inorganics										
Ammonia Nitrogen	mg/L as N	EPA 350.1&D	NA	< 0.10	0.14	< 0.10	< 0.10	< 0.10	< 0.10	DRY
Bicarbonate	mg/L as CaCO3	SM 4500-CO2D	NA	304	199	227	302	232	405	DRY
Calcium	mg/L	EPA 200.7	NA	125	126	92.7	118	140	138	DRY
Chemical Oxygen Demand	mg/L	HACH 8000	NA	< 10	< 10	< 10	< 10	< 10	< 10	DRY
Chloride	mg/L	EPA 300.0	250*	68	106	112	181	189	49	DRY
Fluoride	mg/L	EPA 300.0	4	0.3	0.3	0.2	0.2	0.1	0.2	DRY
Iron	mg/L	EPA 200.7	0.3*	1.93	6.77	0.11	0.13	0.06	0.12	DRY
Magnesium	mg/L	EPA 200.7	NA	44.7	40.2	29	49.6	47	88.2	DRY
Manganese	mg/L	EPA 200.7	0.05*	0.34	0.36	0.02	0.01	0.02	0.35	DRY
Nitrate Nitrogen	mg/L as N	EPA 300.0	10	0.11	0.14	< 0.05	0.62	1.79	0.95	DRY
pH, Field	su	FLD	NA	7.05	7.21	7.44	7.72	7.4	6.95	DRY
pH, Lab	su	SM4500-H+B	NA	8.08	7.84	8.33	8.37	8.32	8.01	DRY
Potassium	mg/L	EPA 200.7	NA	3.9	3.6	3.4	2.9	2	2.9	DRY
Sodium	mg/L	EPA 200.7	NA	56.8	193	70.4	130	93.8	28	DRY
Specific Conductance, Field	umhos/cm	FLD	NA	970	1520	867	1349	1330	1215	DRY
Specific Conductance, Lab	umhos/cm	EPA 120.1	NA	962	1480	874	1320	1300	1160	DRY
Sulfate	mg/L	EPA 300.0	250*	162	461	76	168	200	247	DRY
Alkalinity to pH 4.5	mg/L as CaCO3	SM 18 2320B	NA	308	200	232	309	237	409	DRY
Total dissolved solids	mg/L	SM2540-C	NA	612	1050	504	806	796	806	DRY
Total Organic Carbon	mg/L	SM 18 5310-C	NA	3.2	1.6	3.6	2.8	1.6	1.7	DRY
Phenolics, total	ug/L	EPA 420.1	4000	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0	DRY
Turbidity	NTU	EPA 180.1	NA	132	52.2	1.6	3.6	2.8	10.7	DRY
Organics										
Benzene	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,2-Dibromoethane	ug/L	EPA 8260B	0.05	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,1-Dichloroethane	ug/L	EPA 8260B	27	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,1-Dichloroethene	ug/L	EPA 8260B	7	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,2-Dichloroethane	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
cis-1,2-Dichloroethene	ug/L	EPA 8260B	70	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
trans-1,2-Dichloroethene	ug/L	EPA 8260B	100	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Ethylbenzene	ug/L	EPA 8260B	700	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Methylene Chloride	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Tetrachloroethene	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Toluene	ug/L	EPA 8260B	1000	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,1,1-Trichloroethane	ug/L	EPA 8260B	200	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Trichloroethene	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Vinyl Chloride	ug/L	EPA 8260B	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	DRY
Total Xylene	ug/L	EPA 8260B	10000	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Additional Parameters										
Chromium	mg/L	EPA 200.7	0.10							DRY
Chromium, dissolved	mg/L	EPA 200.7D	0.10							DRY
Naphthalene	ug/L	EPA 8260B	100							DRY
Total Organic Halogen	ug/L	EPA 9020B	NA							DRY

MCL = Maximum Contaminant Level (EPA Federal Drinking Water Standards or Pennsylvania DEP Statewide Health Standards for used aquifers in a residential setting where EPA Standard does not exist)
* These values represent secondary MCLs.
Dry Points: MW-201R, MW-301R, MW-310, MW-310R, MW-P2U, SP-4



REFERENCE
U.S.G.S. 7.5 MINUTE TOPOGRAPHIC QUADRANGLE MAPS OF GLASSPORT, MCKESSPORT, MONOGAHELA AND DONORA, PA

SCALE
2000 0 2000 FT.

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Cincinnati, OH • Columbus, OH • Indianapolis, IN • Nashville, TN

U.S.G.S. SITE LOCATION MAP

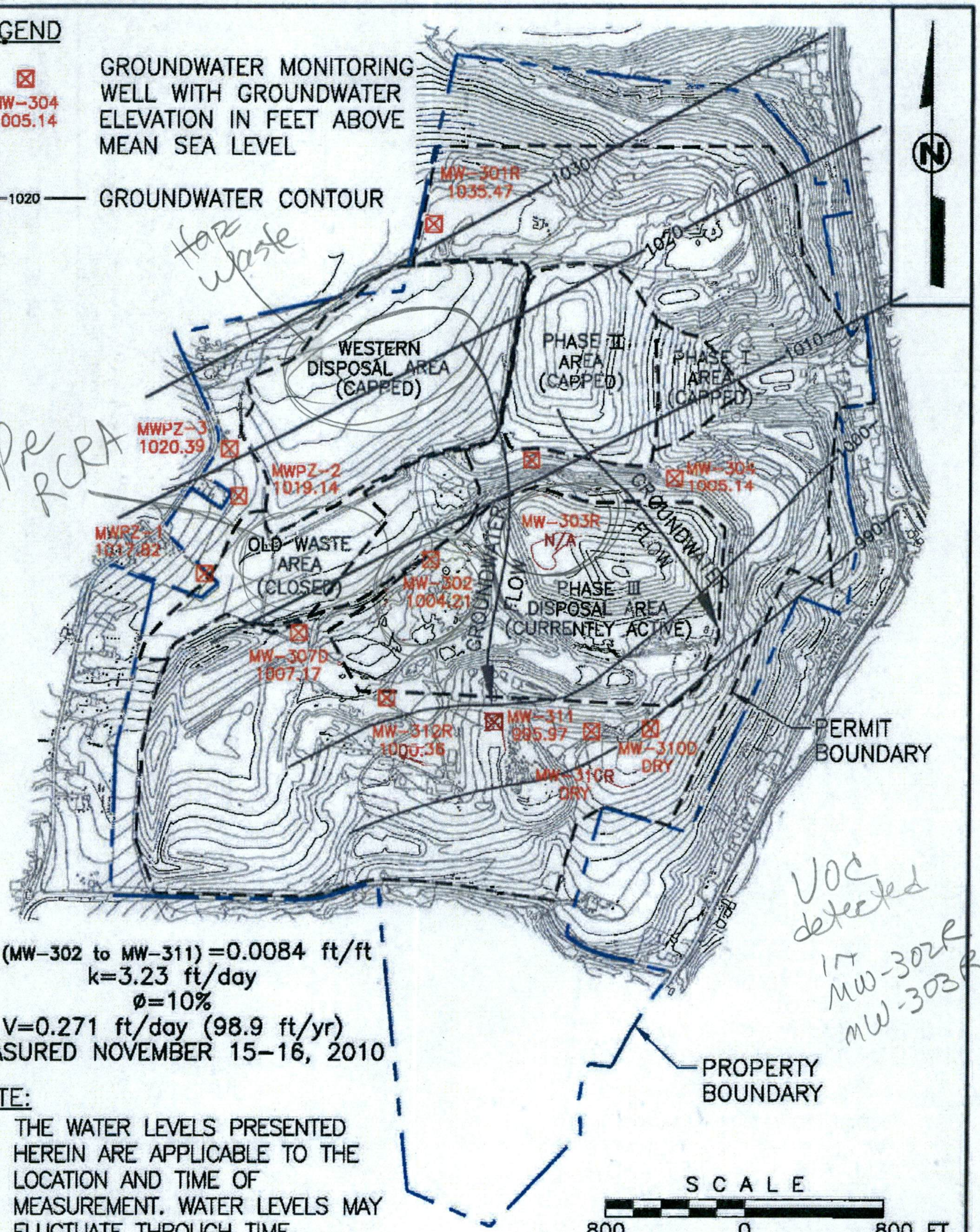
KELLY RUN LANDFILL
PERMIT NO. 100663

DWN. BY: JHG	SCALE: AS SHOWN	DATE: 08/19/05	PROJECT NO.: 050558	FIGURE NO. 1
CHKD. BY: RST				

LEGEND

MW-304 1005.14 — GROUNDWATER MONITORING WELL WITH GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL

1020 — GROUNDWATER CONTOUR



i (MW-302 to MW-311) =0.0084 ft/ft
k=3.23 ft/day
ø=10%
V=0.271 ft/day (98.9 ft/yr)
MEASURED NOVEMBER 15-16, 2010

NOTE:

1. THE WATER LEVELS PRESENTED HEREIN ARE APPLICABLE TO THE LOCATION AND TIME OF MEASUREMENT. WATER LEVELS MAY FLUCTUATE THROUGH TIME.

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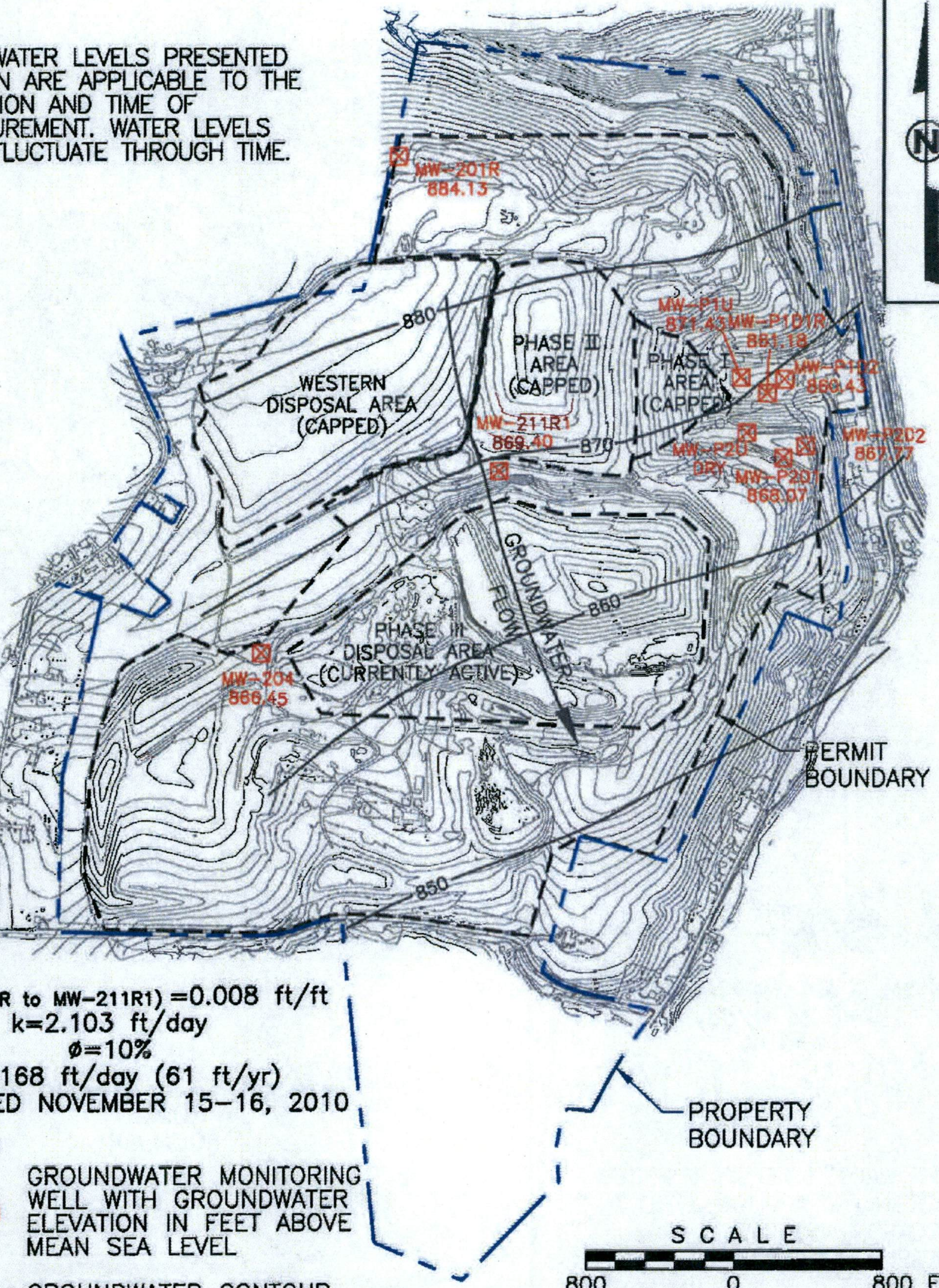
BENWOOD LIMESTONE POTENTIOMETRIC MAP
KELLY RUN LANDFILL
PERMIT NO. 100663

DWN. BY: JHG	SCALE:	DATE:	PROJECT NO.:	
CHKD. BY: LSF	AS SHOWN	02/08/11	050-558.0410	FIGURE NO. 2

G:\PROJECTS\2005\050558\DWG\050558A54.DWG{MODEL} (JGILLIGAN) - FEB 9, 2011 - 11:19:41

NOTE:

1. THE WATER LEVELS PRESENTED HEREIN ARE APPLICABLE TO THE LOCATION AND TIME OF MEASUREMENT. WATER LEVELS MAY FLUCTUATE THROUGH TIME.



$i_{(MW-201R\ to\ MW-211R1)} = 0.008$ ft/ft

$k = 2.103$ ft/day

$\phi = 10\%$

$V = 0.168$ ft/day (61 ft/yr)

MEASURED NOVEMBER 15-16, 2010

LEGEND

MW-P2D1 868.07 — GROUNDWATER MONITORING WELL WITH GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL

—870— GROUNDWATER CONTOUR

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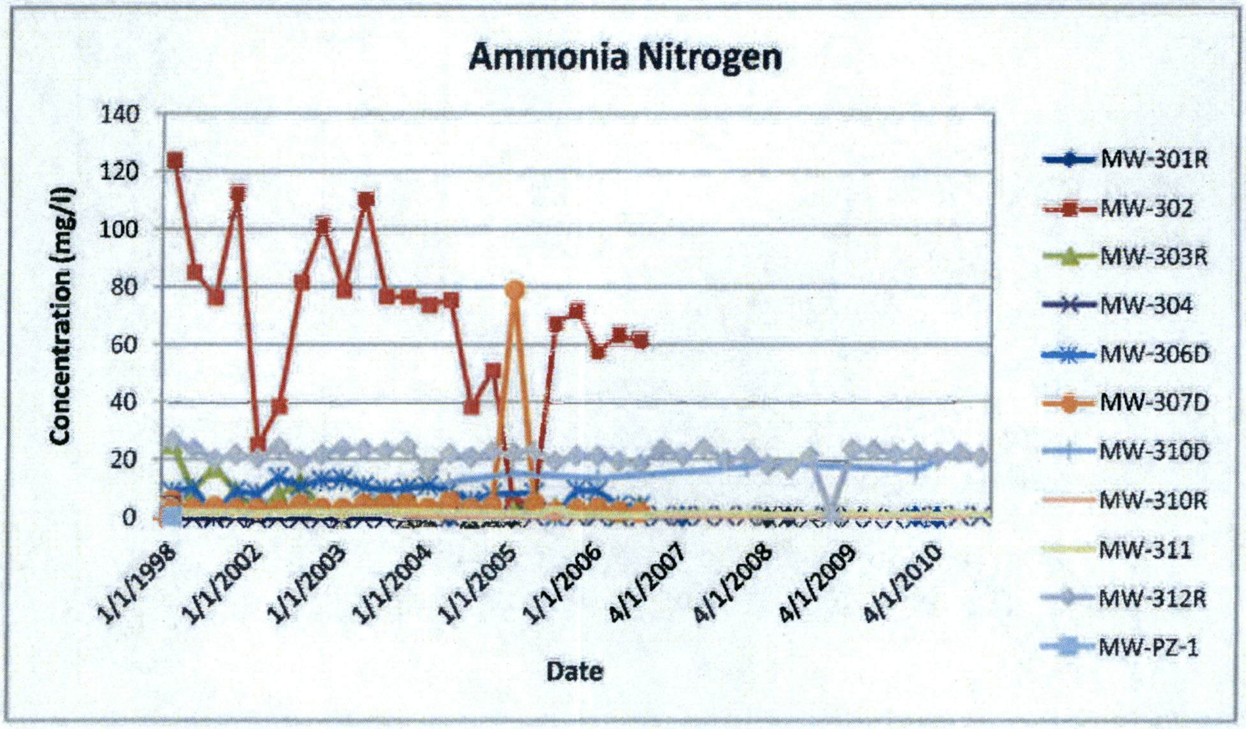
PITTSBURGH COAL
POTENTIOMETRIC MAP
KELLY RUN LANDFILL
PERMIT NO. 100663

DWN. BY: JHG	SCALE:	DATE:	PROJECT NO.:	
CHKD. BY: RJT	AS SHOWN	02/08/11	050-558.0410	FIGURE NO. 3

G:\PROJECTS J5\050558\DWG\050558455.DWG{MODEL} (JGILLIGAN) - FEB 24, 2011 - :21:14

FIGURE 4

KELLY RUN SANITATION, INC
BENWOOD LIMESTONE
TIME SERIES PLOTS



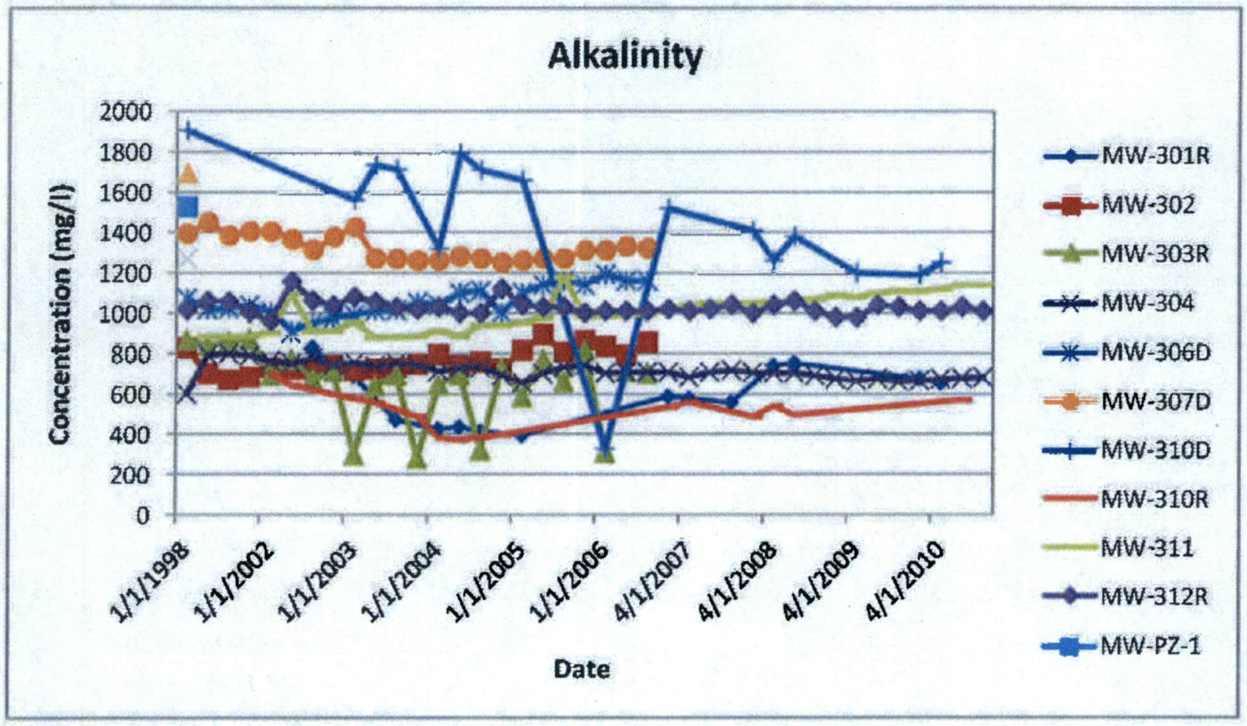
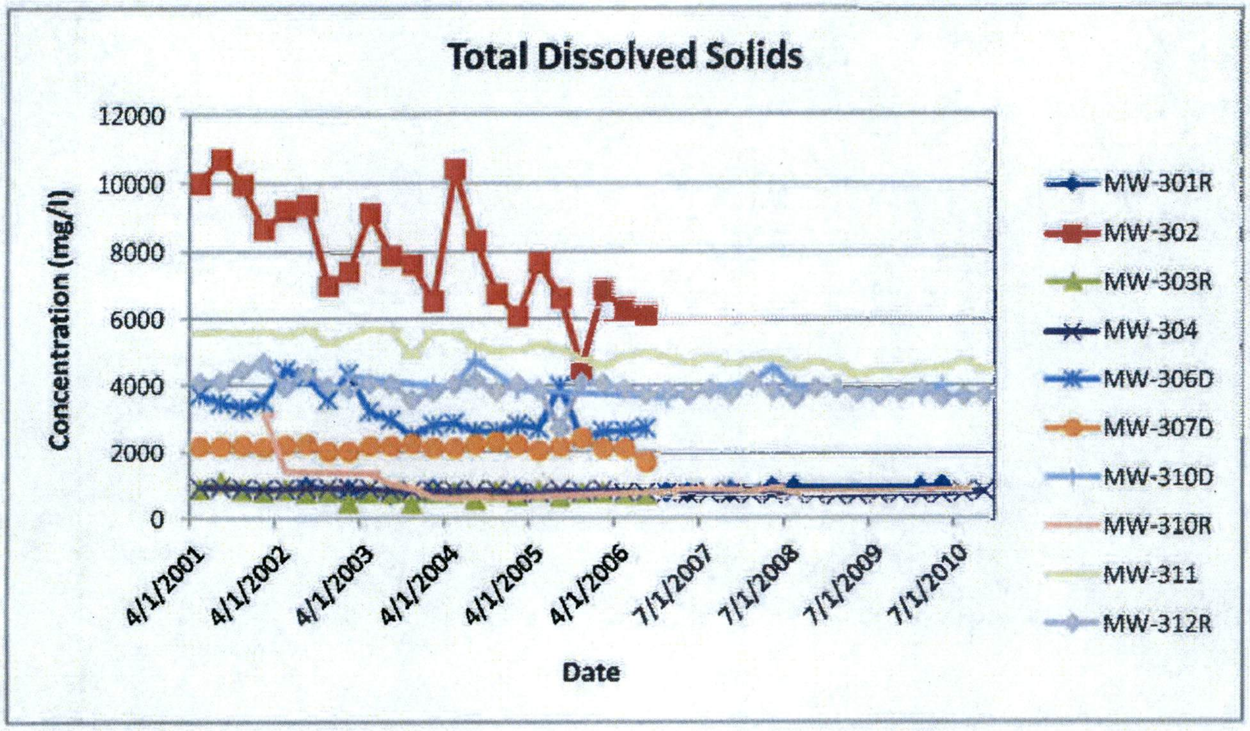


FIGURE 4

KELLY RUN SANITATION, INC
BENWOOD LIMESTONE
TIME SERIES PLOTS



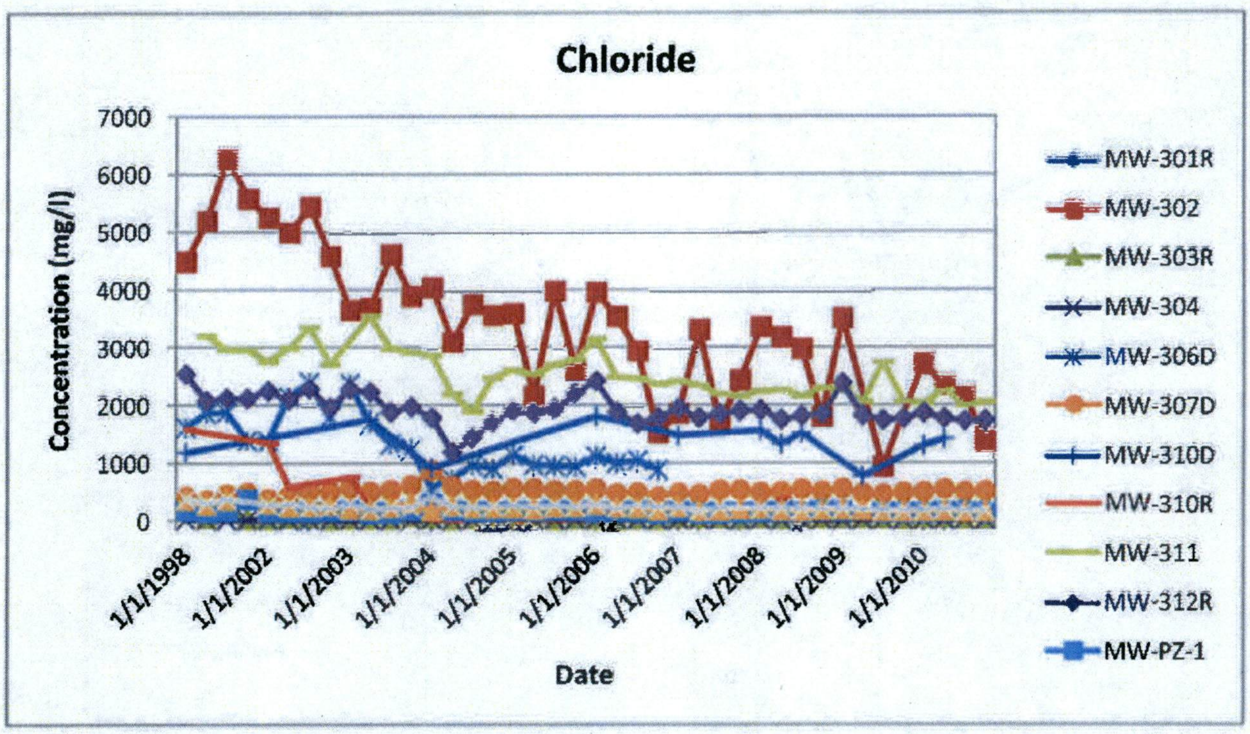


FIGURE 4

KELLY RUN SANITATION, INC
BENWOOD LIMESTONE
TIME SERIES PLOTS

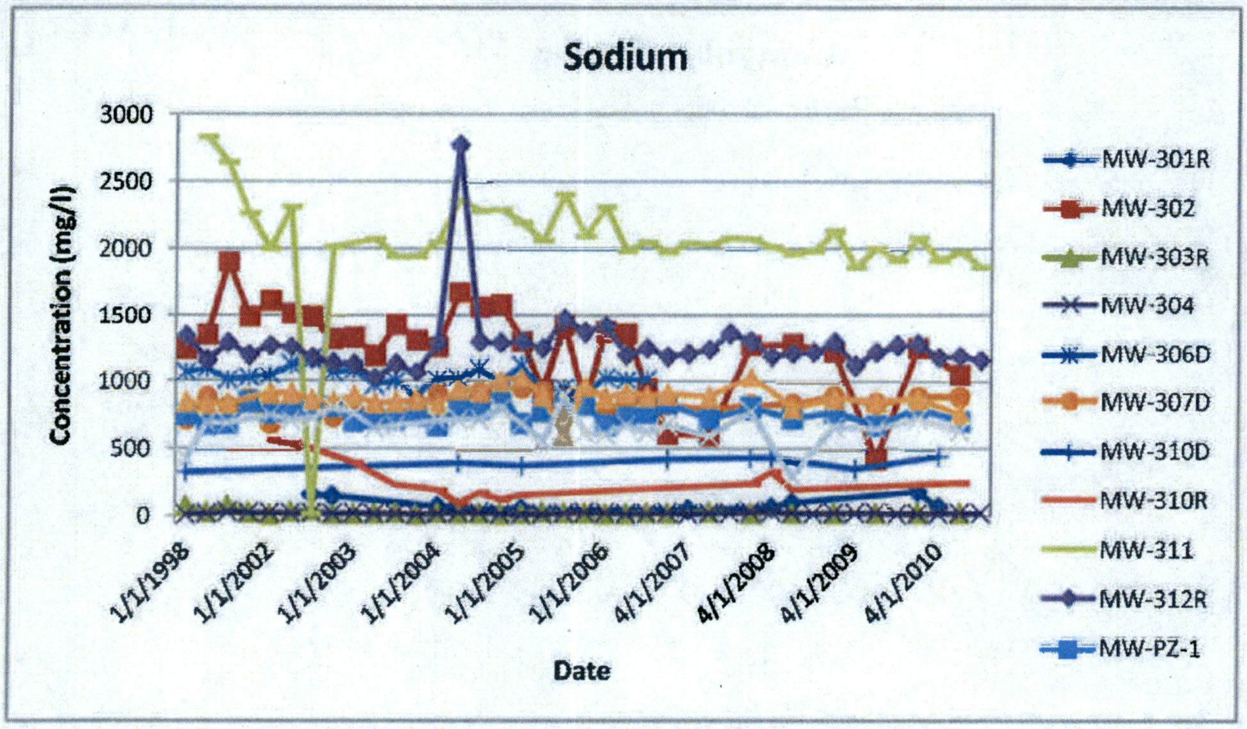
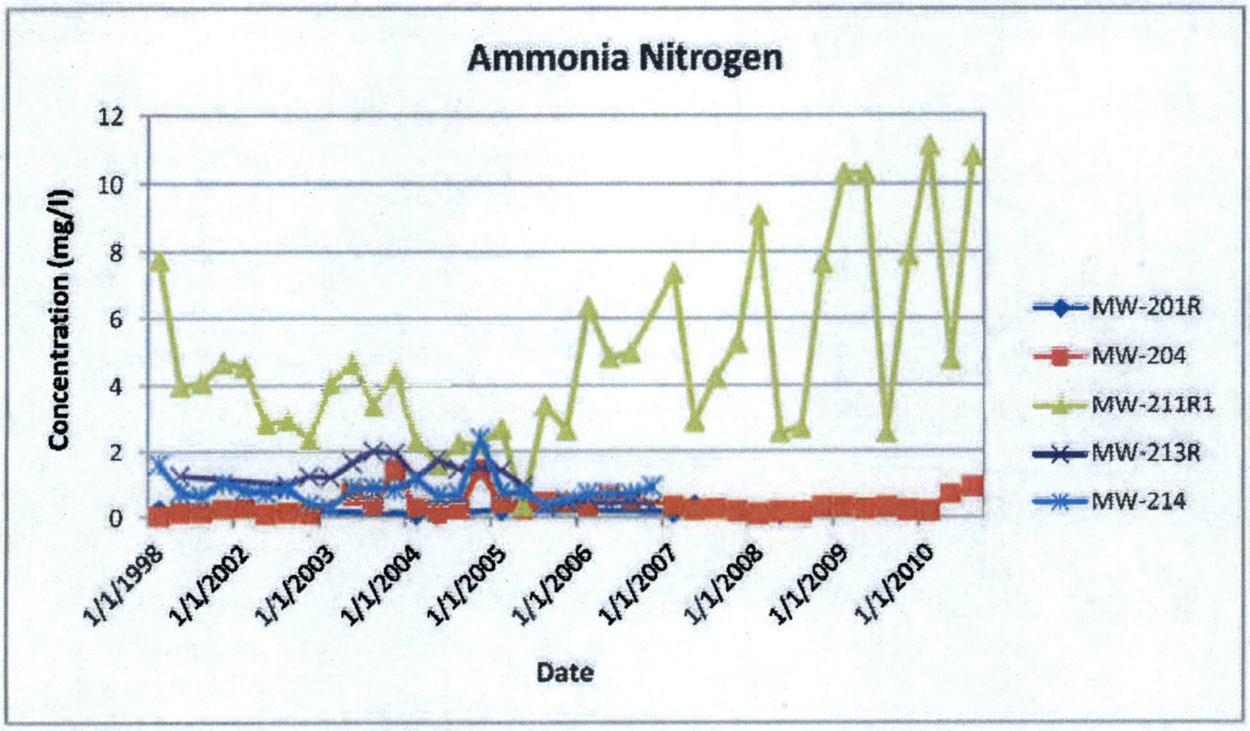


FIGURE 5

KELLY RUN SANITATION, INC
PITTSBURGH COAL
TIME SERIES PLOTS



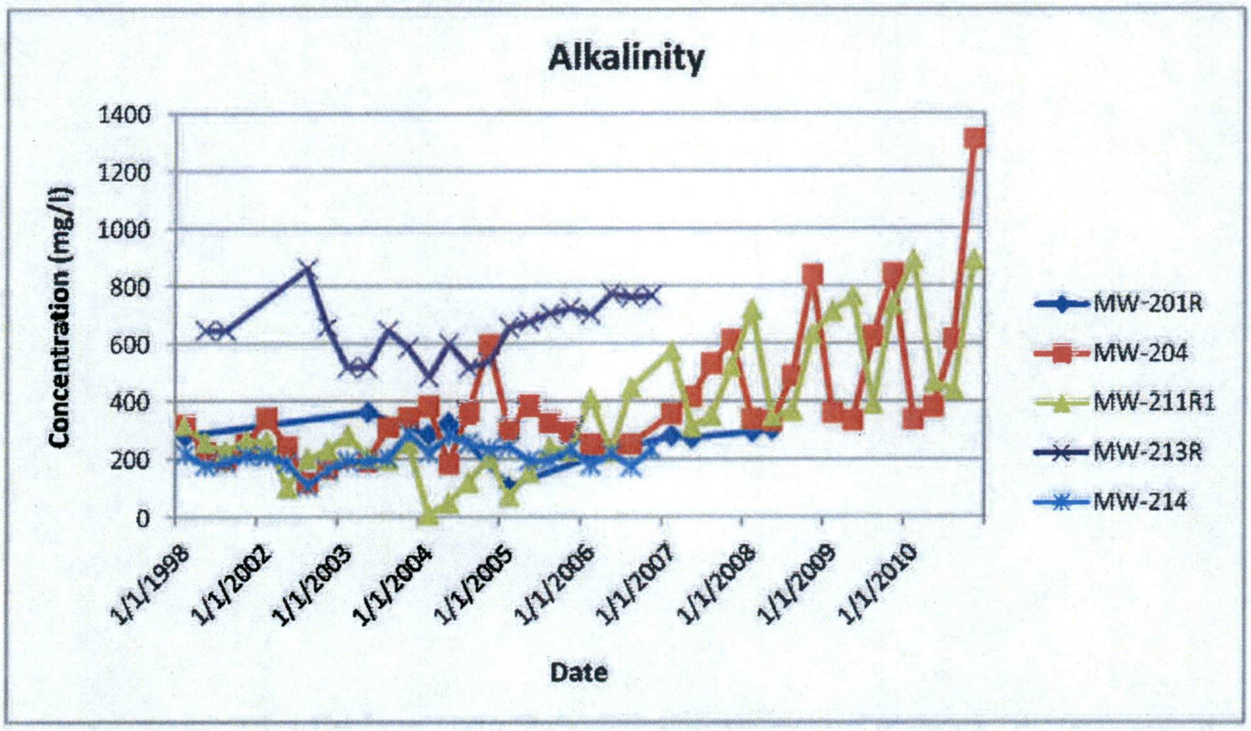
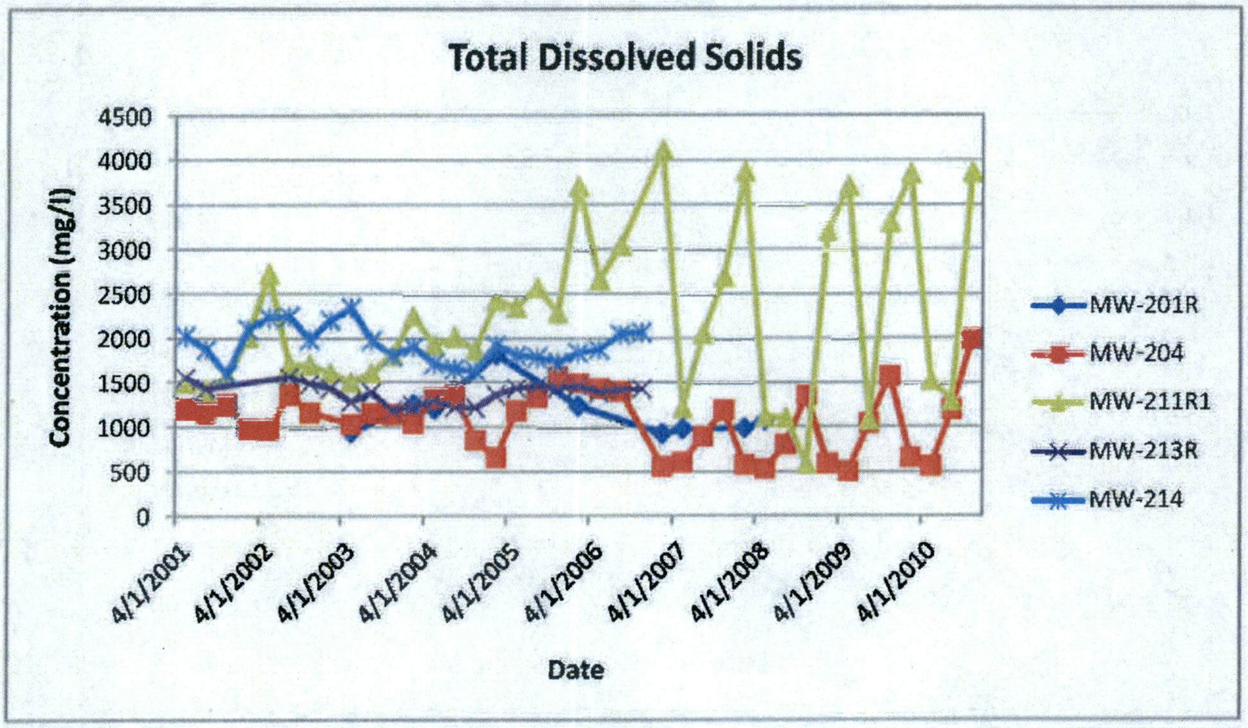


FIGURE 5

KELLY RUN SANITATION, INC
PITTSBURGH COAL
TIME SERIES PLOTS



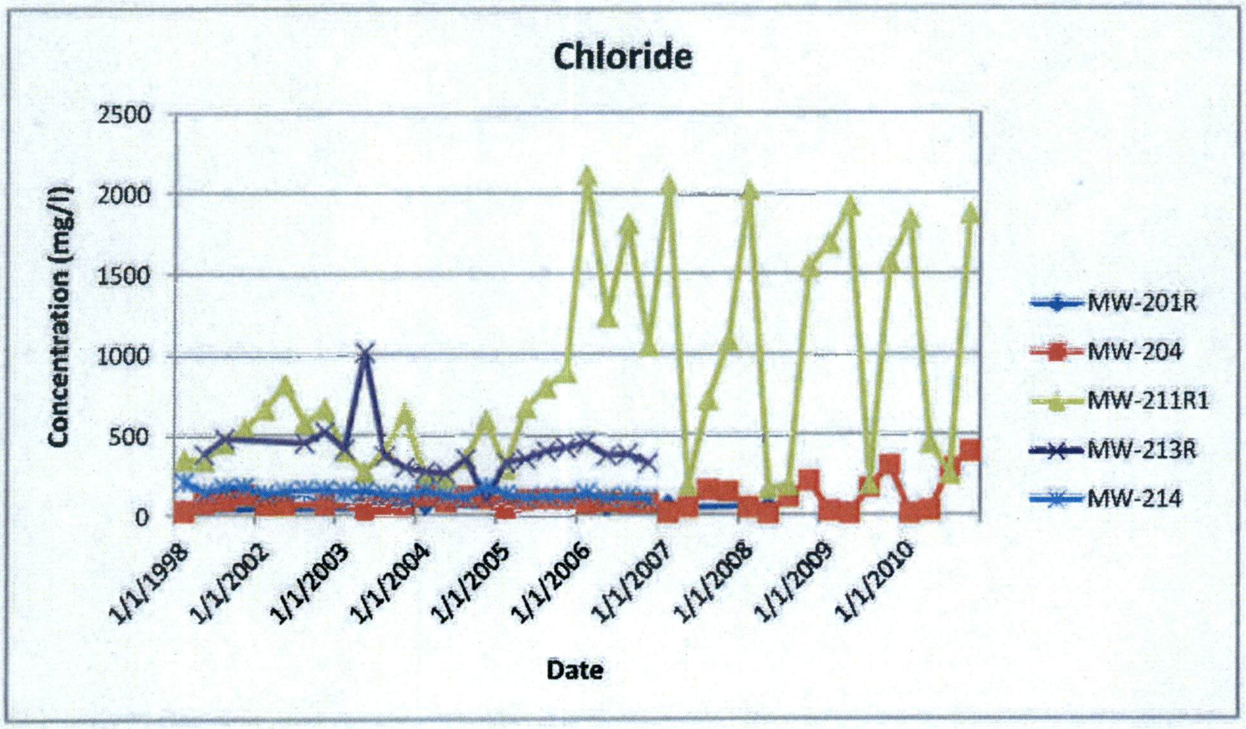


FIGURE 5

KELLY RUN SANITATION, INC
PITTSBURGH COAL
TIME SERIES PLOTS

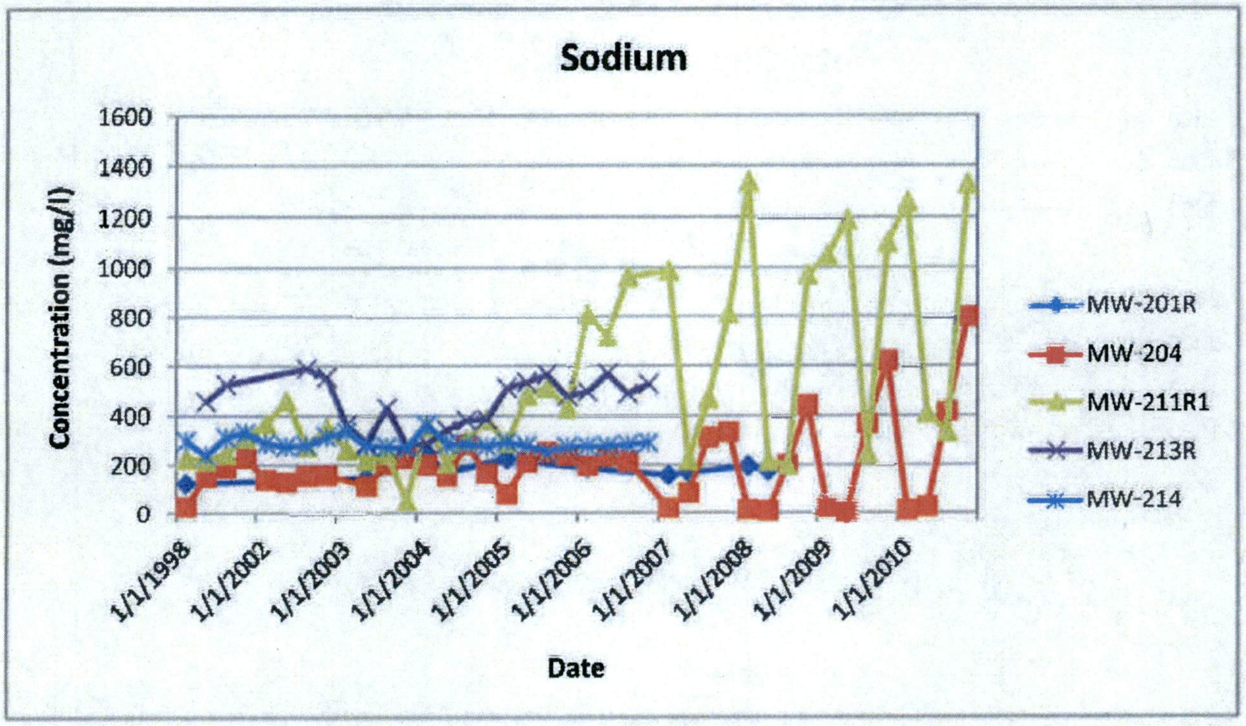
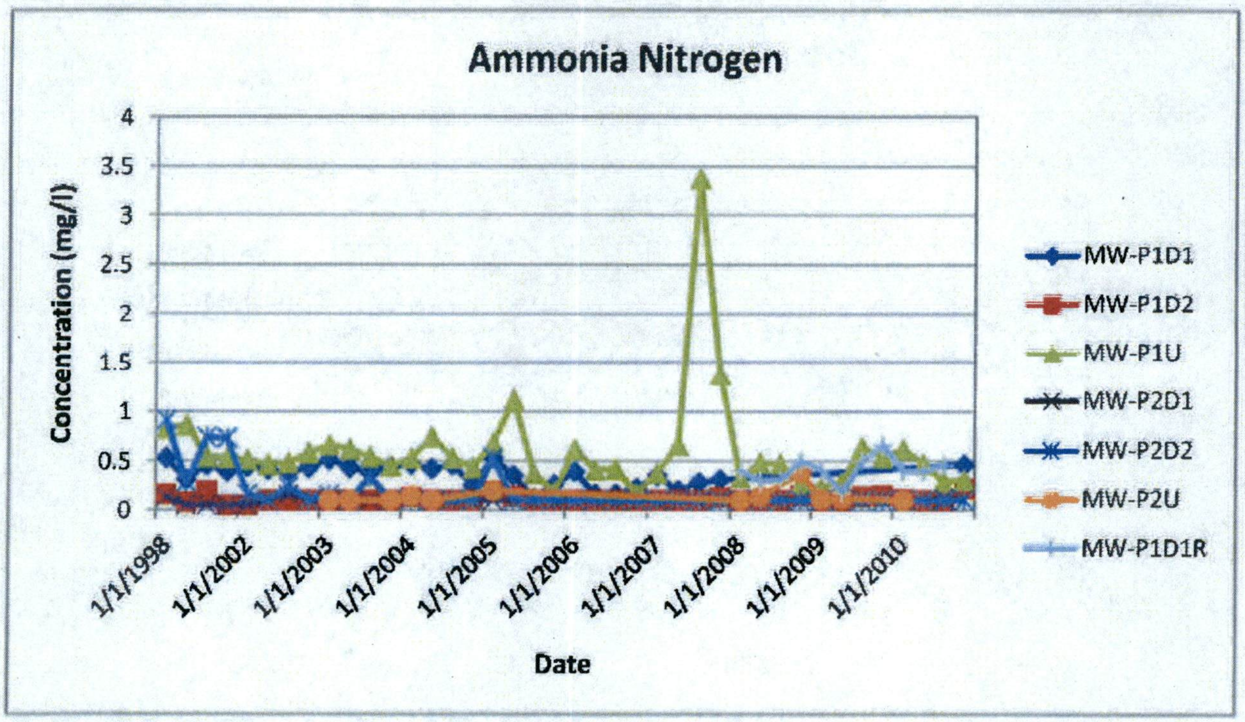


FIGURE 6

KELLY RUN SANITATION, INC
LEACHATE POND
TIME SERIES PLOTS



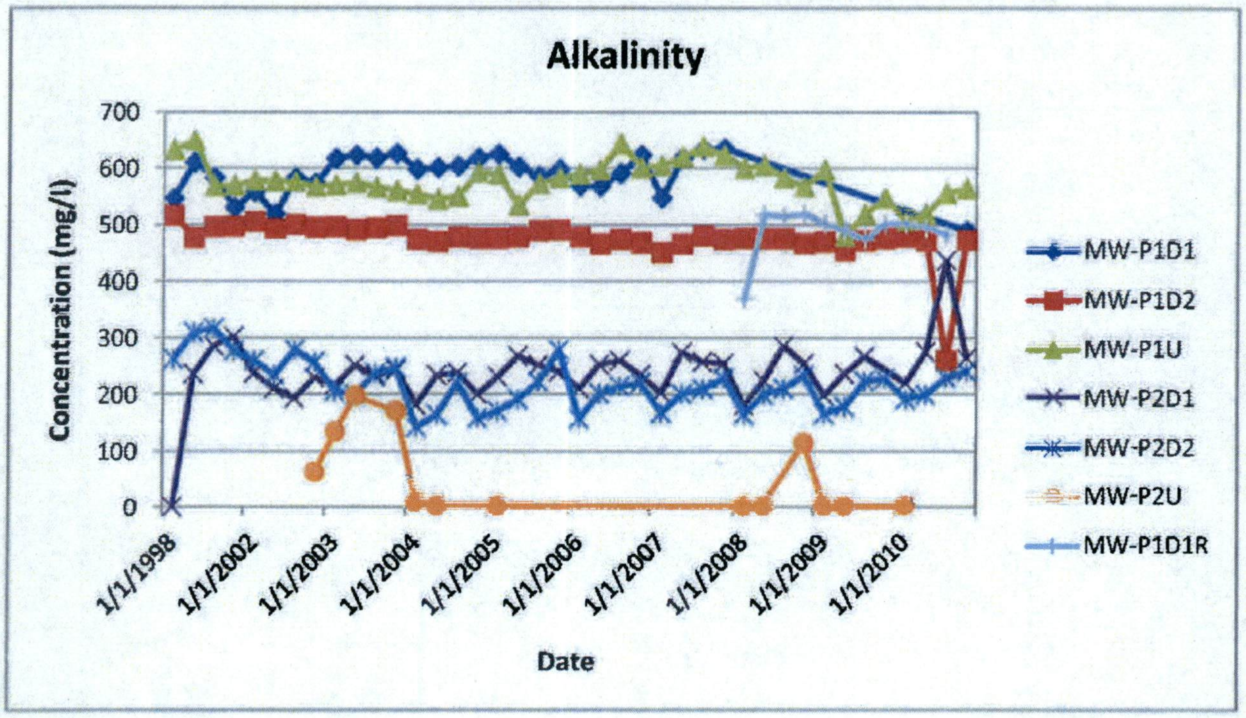
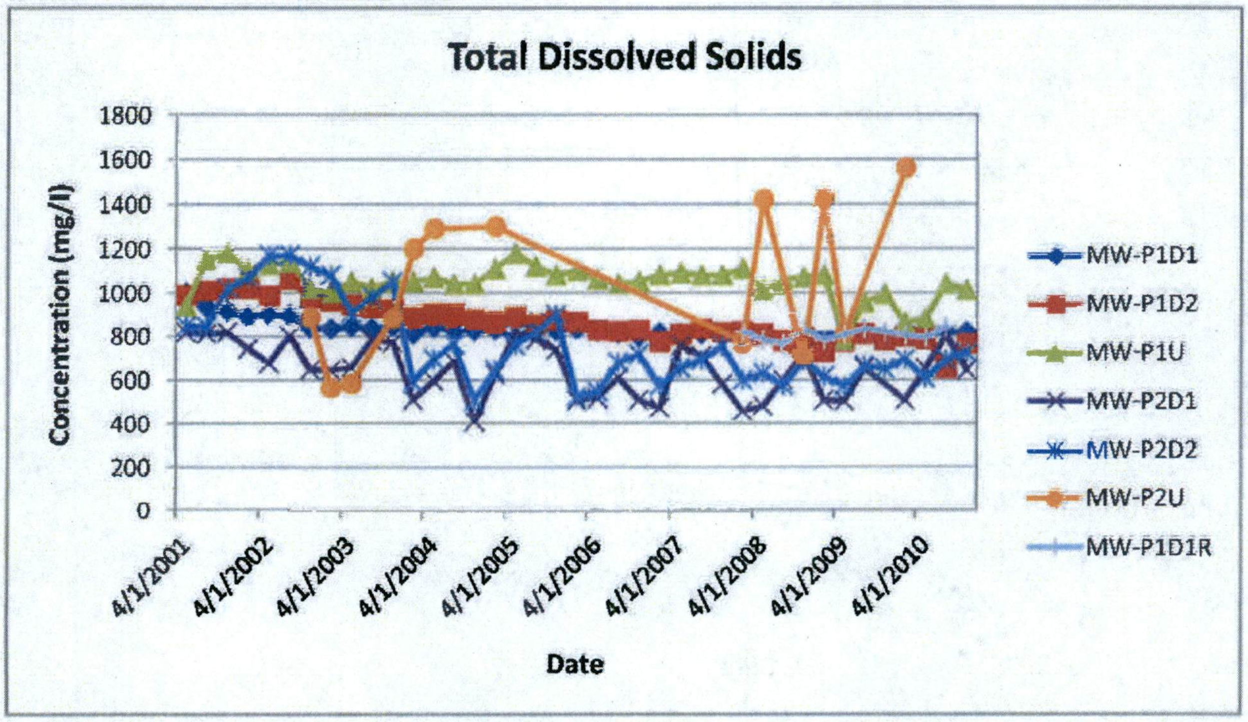


FIGURE 6

KELLY RUN SANITATION, INC
LEACHATE POND
TIME SERIES PLOTS



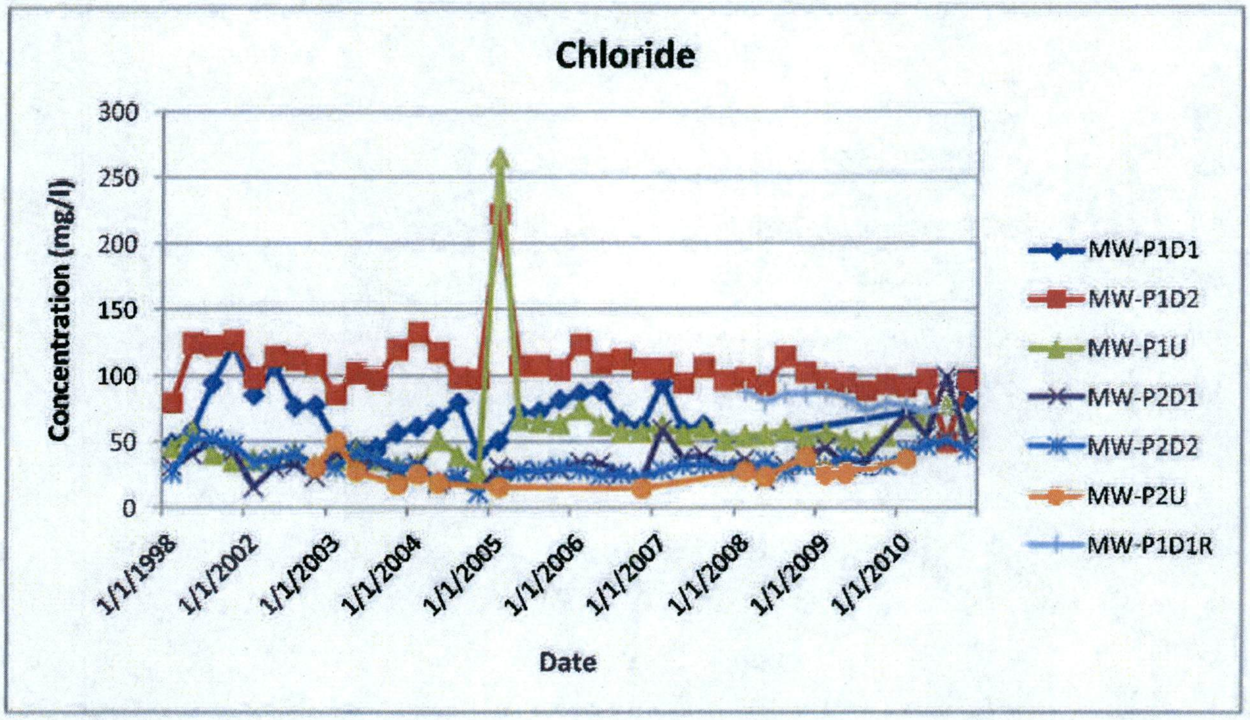
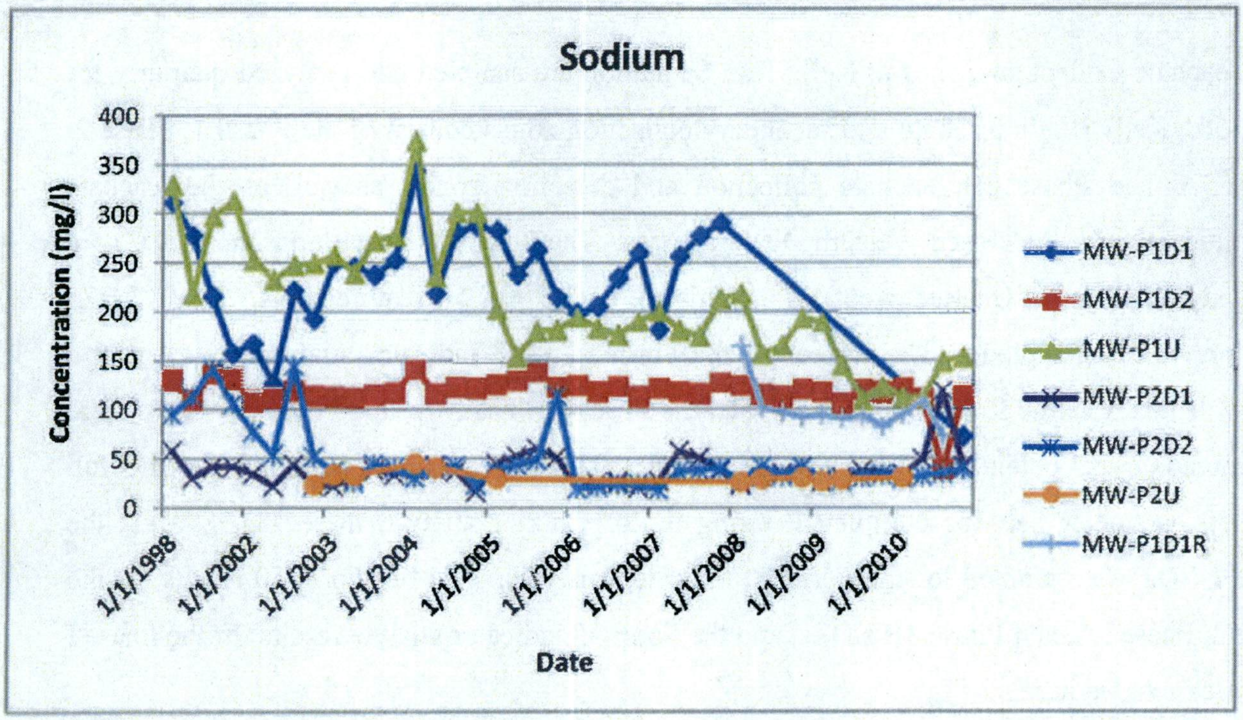


FIGURE 6

KELLY RUN SANITATION, INC
LEACHATE POND
TIME SERIES PLOTS



APPENDIX D
LEACHATE SAMPLING AND ANALYSIS

The Leachate Collection Zones at Kelly Run Sanitation are sampled and analyzed quarterly for Form 50. Kelly Run's leachate and secondary collection zones consist of the Phase 1, Phase 2, Phase 3A, and Phase 3B leachate collection and detection zones, as well as the leachate collection zone for the closed Western Disposal Area. The Leachate Detection Zones (LDZ) are sampled annually (4th Quarter event) in accordance with Form 50 requirements. These LDZs were previously sampled and analyzed for the Form 50 LDZ indicator analytes. Based on a review of this baseline fluid composition data, the Phase 2, Phase 3A, and Phase 3B LDZs were determined to be potentially leachate influenced. Therefore, annual sampling for the full Form 50 parameter list was completed during the 4th Quarter 2010 at these LDZs, while the Phase 1 LDZ was sampled for the Form 50 indicator analytes. The full Form 50 results for the Phase 2, Phase 3A, and Phase 3B LDZs, and the Form 50 indicator analyte results for the Phase I LDZ are included herein.

Based on a review of the data for the LDZ samples collected during the 4th Quarter 2010, MCL exceedances were noted. Therefore, the Form 19 detection zone add-on list will be included in the annual groundwater sampling program completed during the 1st Quarter 2011.

APPENDIX E
METHANE PROBE MONITORING

1.0 INTRODUCTION

The following methane monitoring report is a summary and evaluation of the gas monitoring and control activities for the Kelly Run Sanitation, Inc. Landfill (KRS) located in Forward Township, Allegheny County, Pennsylvania for the quarterly period ending December 31, 2010. Results of the quarterly gas probe monitoring data collected on December 14 – December 20, 2010 are submitted herein as part of the KRS Quarterly Monitoring Report.

1.1 BACKGROUND

KRS Landfill currently maintains and utilizes a system of landfill gas monitoring probes to monitor for the presence of methane. The current system includes 133 probes located spatially around the landfill boundaries (13 probes were decommissioned prior to the 4th Quarter 2006 event in accordance with the August 14, 2006 WDA Permit). The landfill gas monitoring probes are generally constructed of a single perforated PVC well casing installed at a shallow depth, often referred to as the "A" zone. Nested probes (two or three probes at the same location) monitor for the presence of methane in the shallow ("A"), intermediate ("B"), and deep ("C") zones.

The majority of gas monitoring probes in both the Western and Municipal Disposal Areas are screened within the Benwood Limestone Aquifer. Some of the shallow probes monitor the Waynesburg and Uniontown Formations above the Benwood Limestone. Deeper probes monitor the Sewickley, Redstone, and Pittsburgh Sandstones.

APPENDIX E
(Continued)

1.2 REPORTING REQUIREMENTS

The monitoring of landfill gas (methane) concentrations is conducted on a quarterly basis following the requirements set forth in PA Code Title 25 Section 273.292, Gas Control and Monitoring and Pennsylvania Department of Environmental Protection (PADEP) Permit Conditions.

PA Code 273.292 provides the following criteria to determine the regulatory compliance of combustible gas levels at the landfill:

1. 25% of the lower explosive limit (LEL) at a structure within the landfill site.
2. The LEL at the boundaries of the landfill site.
3. 25% of the LEL in an adjacent area, including buildings or structures on adjacent areas.

The maximum acceptable combustible gas concentrations permitted under current regulatory and permit requirements is 5.0% methane in air. This concentration is equal to 100% of the LEL. Concentrations above the maximum acceptable limit of 5.0% are reported to PADEP and the Allegheny County Health Department (ACHD). In the event an exceedance of this limit occurs in a given monitoring probe, daily monitoring of the probe is initiated and continued until the methane level reaches acceptable limits. Persistent exceedances occasionally require additional gas extraction efforts in those areas.

1.3 LANDFILL GAS MONITORING PROCEDURES

Written protocols for conducting methane monitoring were established in accordance with Permit Condition No. 21 of the Solid Waste Landfill Permit Modification dated February 6, 1997 and the August 14, 2006 WDA Permit.

APPENDIX E
(Continued)

The Landfill Gas Monitoring Procedures for obtaining methane concentration readings from the monitoring probes were submitted to PADEP in a report dated April 7, 1997. Specifically, the procedures address the need to maintain the proper instrument calibration, obtain and document all necessary readings, evaluate probe water levels, and the dewatering of probes were necessary. KRS conducted the landfill gas monitoring according to these approved procedures. In addition, any liquids removed during probe dewatering are disposed of into the leachate manhole consistent with the requirements of the March 13, 1996 Consent Decree.

2.0 LANDFILL GAS MONITORING

The landfill gas monitoring system consists of both single and nested design probes. All 133 gas monitoring probes were tested for the presence of methane. The following Gas Monitoring Probe Field Log presents a summary of the methane and LEL concentrations for each gas monitoring probe tested.

No methane was detected at the LEL level at any probe for this monitoring period.

3.0 CONCLUSIONS

The LEL concentration was not detected at any monitoring probe. Therefore, all methane gas monitoring probes in the KRS network continue to demonstrate compliance with the acceptable regulatory limit of 5.0%.

APPENDIX F

DUST FALL ANALYSIS

Dust collection analysis is performed monthly through the placement of dust fall jars around Kelly Run Sanitation Landfill. The jars are collected monthly and fresh jars are placed in the holders.

No samples exceeded the maximum dust fall of 1.5 mg/cm^2/month during the 4th Quarter 2010 as specified in PA 25 §273.217 and cited in PA 25§131.3.

WASTE MANAGEMENT

KELLY RUN SANITATION, INC. LANDFILL
FORWARD TOWNSHIP, ALLEGHENY COUNTY
PENNSYLVANIA
PADEP I.D. NO. 100663

QUARTERLY REPORTING REQUIREMENTS

THIRD QUARTER 2010

Submitted:
November 2010

Prepared by:
Civil & Environmental Consultants, Inc.
4000 Triangle Lane, Suite 200
Export, PA 15632-9255
CEC Project 050558

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(Continued)

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1.0 INTRODUCTION

1.1 SCOPE AND PURPOSE

This report summarizes the results of the 3rd Quarter 2010 groundwater monitoring activities at Kelly Run Sanitation, Inc. Landfill (KRS). This work was conducted on August 31 – September 1, 2010 to satisfy requirements of the Pennsylvania Department of Environmental Protection (PADEP). KRS operates a municipal waste landfill (Permit I.D. No. 100663) in Forward Township, Allegheny County.

KRS has been operating since 1965 and consists of five disposal units (Figures 1, 2, and 3):

- 17-acre pre-RCRA disposal area identified as the Old Waste Area (OWA) has been closed since early 1970s and was capped in 1997;
- A 9.0-acre Phase I Area closed municipal waste landfill, that was capped in 1996 (operating permit issued March 14, 1991);
- A 24.3-acre Phase II Area closed municipal waste landfill, that was capped in 1998 (operating permit issued January 18, 1995);
- A Phase III Area active municipal waste landfill (operating permit issued February 6, 1997); and
- The 35.0-acre Western Disposal Area (WDA), a closed and capped hazardous waste landfill (Hazardous Waste Postclosure Permit U.S. Environmental Protection Agency ID No. PAD004810222).

The Groundwater Monitoring Program at KRS incorporates permanent monitoring elements to provide environmental protection during and after landfill development. Field work, sampling methodologies, data evaluation, data QA/QC, and chemical analyses were conducted in accordance with the approved site permits.

1.2 SITE DESCRIPTION AND BACKGROUND

KRS currently receives municipal waste at a rate of about 8,000 tons per month. The facility consists of a 408-acre parcel, of which 48 acres are currently approved for active waste disposal. KRS is permitted to take municipal solid waste and other approved special wastes.

The WDA consists of approximately 35 acres and is a closed hazardous waste disposal landfill. The WDA was constructed with an engineered clay liner and leachate collection system (i.e., interceptor drain) and was capped with a very low density polyethylene (VLDPE) geomembrane in the early 1990s. The 17-acre OWA is a natural attenuation landfill that was capped in 1997. Phase I (9.0 acres) and Phase II (24.3 acres) landfill areas were constructed as lined landfills and were completely capped and closed in 1998. Both Phase I and Phase II have leachate detection zones. The Phase III area is a 48-acre permitted double-lined landfill with a leachate detection zone. The Phase III landfill is the only active waste placement area at the landfill and receives approximately 280 tons per day of solid waste.

2.0 GEOLOGY AND HYDROGEOLOGY

2.1 REGIONAL GEOLOGY

KRS is located within the Appalachian Physiographic Province (Heath, 1984). This province is characterized by relatively deeply incised valleys and low rolling hills. KRS is constructed within the head of a relatively deeply incised valley and upon the adjacent ridge to the south. The surficial bedrock geology of KRS consists of Paleozoic deposits of the Monongahela and Conemaugh Groups. No Quaternary sedimentary deposits exist at the site. The entire site area has been deep-mined for the Pittsburgh Coal.

2.2 LOCAL GEOLOGY

The Pennsylvanian-aged Monongahela Group is defined as the interval between the base of the Waynesburg Coal and the base of the Pittsburgh Coal. The Monongahela has an average thickness of 350 feet in this portion of southwestern Pennsylvania and consists of five units, from stratigraphically lowest to highest: Pittsburgh, Redstone, Sewickley, Uniontown, and Waynesburg. The Pittsburgh Formation consists of approximately 100 feet of coal, shale, limestone, and sandstone and is conformably overlain by the Redstone Formation. The Redstone is approximately 80 feet thick and includes the interval between the Redstone Limestone and the base of the Sewickley Coal. The Redstone Coal is approximately 2 to 4 feet thick and the Pittsburgh Coal seam is 8 to 9 feet thick.

2.2.1 Uniontown Formation

The Uniontown Formation, the uppermost unit exposed at KRS, consists of 50 to 90 feet of interbedded shale, claystone, limestone, and sandstone. Only 20 feet of the Upper Member of the Uniontown is exposed on the adjacent hilltops. The Lower Member of the Uniontown Formation rests conformably beneath the Upper Member. In this area, the Lower Member is approximately 30 to 35 feet thick. The basal unit of the Lower Member is the Uniontown Coal, which is usually represented by 12 to 18 inches of carbonaceous shale. The lithologic units above the Uniontown Coal are comprised of

interbedded sandstone and shale through the lower and middle parts of the member and interbedded calcareous shale and argillaceous limestones in the upper part. Both the Upper Member and the Lower Member are moderately to severely weathered in outcrops exposed by earth moving activities at the site.

2.2.2 Pittsburgh Formation

The Pittsburgh Formation is located stratigraphically between the Uniontown Coal at the top and the base of the Pittsburgh Coal. This formation has a thickness of about 255 feet at the site. The Pittsburgh Formation consists of five members, from stratigraphically highest to lowest: Upper Member, Sewickley Member, Fishpot Member, Redstone Member, and the Lower Member.

2.2.2.1 Upper Member - The Upper Member extends from the bottom of the Uniontown Coal to the top of the Benwood Limestone Bed in the Sewickley Member. The Upper Member is in the range of 80 to 90 feet thick at the site and is comprised of interbedded shale, claystone, and argillaceous limestone. Many of the shale and claystone beds are calcareous. There are four persistent limestone beds in the Upper Member that are identified from stratigraphically highest to lowest as Limestone D, Limestone C, Limestone B, and Limestone A (Dodge, 1985 and Johnson, 1929). These limestone beds were considered part of the Benwood Limestone in older geologic literature, but they have been divided into individual beds in the Upper Member in recent geologic information. The four limestone beds range in thickness from about 1-foot to as much as 10 feet thick, although where the limestone beds are thicker than about 2 feet, they commonly have thin interbedded shale or claystone partings several inches thick.

2.2.2.2 Sewickley Member - The Sewickley Member extends from the top of the Benwood Limestone at the top of the Sewickley Member to the base of the Sewickley Coal at the base of this member. In the Phase III landfill area and adjacent areas, the Sewickley Member is 50 to 60 feet thick. The Benwood, which is the dominant unit in this member, is comprised of interbedded argillaceous limestone, shale, claystone, and fine-grained sandstone beds. Individual limestone beds can be 5 to 6 feet thick, but are

typically about 2 feet thick. Calcareous shale, claystone, and fine-grained sandstone beds separate the limestone beds. The bottom 5 to 10 feet of the member is comprised of shale and includes the Sewickley Coal bed, which in this area is a carbonaceous shale bed up to 4 feet thick.

2.2.2.3 Fishpot Member - The Fishpot Member of the Monongahela Group occupies the interval from the bottom of the Sewickley Coal at the top to the top of a limestone bed, which is the uppermost bed in the underlying Redstone Member. The Fishpot Member has an average thickness of 20 feet at the site and is comprised of sandstone, limestone, and shale.

2.2.2.4 Redstone Member - The Redstone Member occupies the interval from the top of the limestone bed mentioned above to the bottom of the Redstone Coal. This member has a thickness in the range of 30 to 35 feet and is comprised of an argillaceous limestone bed in the upper 5 feet and is underlain by shale with some thin interbedded sandstone units. The Redstone Coal horizon, which is the basal unit of the member, varies in thickness from 2 to 4 feet thick within the area.

2.2.2.5 Lower Member - The Lower Member of the Monongahela Group occupies the interval from the bottom of the Redstone Coal at the top of the Member to the bottom of the Pittsburgh Coal at the base of the Member. The Lower Member is 70 to 80 feet thick and is comprised predominantly of shale and claystone. The Pittsburgh Coal, the basal unit in this Member, has been deep-mined under the entire site area. The coal has a thickness of 8 to 9 feet in the vicinity of the site. Mine maps for the underground mine workings indicate that the coal was mined by the complete retreat method after room-and-pillar mining (DEI, 1996a).

2.2.3 Conemaugh Group

Underlying the Monongahela Group is the Conemaugh Group. This group of rocks has a thickness of 550 to 600 feet in the western Pennsylvania area and is comprised of interbedded sandstone, shale, and claystone units with thin limestone beds and thin coal

beds that are not economically important resources. The Conemaugh Group lies below drainage in the area.

2.3 STRUCTURAL GEOLOGY

The Appalachian Physiographic Province is characterized by a series of low amplitude, symmetrical, and subparallel anticlines and synclines. Regionally, these fold axes trend roughly north/northeast-south/southwest. KRS is located on the east limb of the Roaring Run (Murrysville) Anticline and strata at the site generally strike N80° E and dip 2° SE.

2.4 SITE HYDROGEOLOGY

The monitoring well network targets the water-bearing zones where any potential impact would be observed at the earliest possible time. Two aquifers have been identified at KRS: the Benwood Limestone and the Pittsburgh Coal. Vertical gradients between the aquifers are generally downward (DEI, 1995).

2.4.1 Benwood Limestone Hydrostratigraphic Unit

Groundwater occurs under perched conditions within the Benwood Limestone (DEI, 1996a). Published reports indicate that the Benwood Limestone is a poor producer of groundwater in southern Allegheny County (Piper, 1933). Piper (1933) indicates that in this area the yields from the Benwood Limestone are small and erratic and a considerable proportion of wells completed into this unit are unsuccessful.

Groundwater flow direction is dictated by the gentle southeastward dip that occurs throughout the site area. The horizontal gradient is 0.0098 ft/ft (measured August 31 – September 1, 2010; calculated from MW-302 to MW-311) (Figure 2). Discharge from the Benwood Limestone Hydrostratigraphic unit is primarily to springs in the site area and local surface water bodies. The unnamed tributary to Fallen Timber Run is the principal receiving stream downgradient of the site.

Groundwater within the Benwood occurs as a result of secondary porosity caused by joint and fracture planes occurring within the rock. Primary porosity occurring with the Benwood appears to be negligible (DEI, 1996a). Groundwater within the Benwood occurs at the base of this unit, and downward vertical flow is restricted by the underlying carbonaceous shale of the Sewickley Coal horizon. Constant-rate pumping tests indicate that the measured hydraulic conductivity is approximately 1.14 x 10^{-3} cm/sec (3.23 ft/day) and calculated porosity is 10 percent (DEI, 1996a).

Wells drilled through the Benwood and completed in the Pittsburgh Coal are characterized by not having encountered groundwater. DEI (1996a and 1996b) noted that groundwater flow does not occur between the Benwood and the Pittsburgh Coal and the geochemical fingerprints for these individual hydrostratigraphic units are different.

Groundwater within the Benwood is classified as a calcium-magnesium bicarbonate type of water. However, groundwater sampled from wells located south (downgradient) of the WDA [reported from Benwood monitoring wells MW-302, MW-303 (redrilled as MW-303R), MW-305 (decommissioned), MW-306 (decommissioned), and MW-307] are dominant in sodium, chloride, or both sodium and chloride (DEI, 1996a).

2.4.2 Pittsburgh Coal Hydrostratigraphic Unit

The Pittsburgh Coal Hydrostratigraphic Unit consists of the remnant mine workings, voids, and stumps in the retreat-mined Pittsburgh Coal. Piper (1933) concluded from mining observations that the Pittsburgh Coal in this area is not generally a water-bearing unit. Groundwater quality in the Pittsburgh Coal is generally degraded due to the presence of elevated levels of metals and sulfate. DEI (1996b) reported that groundwater within the Pittsburgh Coal is, in general, a non-dominant cation sulfate type of water.

Groundwater in the Pittsburgh Coal occurs under unconfined conditions (DEI, 1996b). A mine pool probably exists downgradient of the landfill. Groundwater recovered from the generally dry Pittsburgh Coal groundwater monitoring wells shows an acid-mine drainage characteristic (i.e., elevated concentrations of sulfate, iron, magnesium,

aluminum). Further, springs issuing from the Pittsburgh Coal 1 to 2 miles downgradient of the landfill show no influence related to leachate indicator parameters, but do show elevated acid-mine drainage constituents (DEI, 1996b). Consequently, DEI (1996b) concluded that the Benwood aquifer is not draining to the Pittsburgh Coal.

The Pittsburgh Coal unit occurs approximately 210 feet below the base of the active landfill (double-lined Phase III area). The Pittsburgh Coal has a measured hydraulic conductivity of 7.42×10^{-4} cm/sec (2.103 ft/day) (DEI, 1996b). Groundwater flow in this unit is structurally controlled and generally follows dip slope to the south-southeast (Figure 3). The Pittsburgh Coal has a measured horizontal hydraulic gradient (measured May 4 – 6, 2009; calculated from MW-201R to MW-211R1) to the south of 0.009 ft/ft. The effective porosity of the Pittsburgh Coal is estimated at 10 percent (DEI, 1996b).

3.0 FIELD PROGRAM, MONITORING RESULTS, AND DISCUSSION

3.1 VISUAL INSPECTION PROGRAM

The visual inspection program was implemented at KRS to aid in the early detection of a potential release. The visual inspection program performed by the sampling team includes physical examination of any stresses in biological communities, unexplained changes in soil characteristics, visible signs of leachate migration (i.e., leachate seeps), potential water table mounding beneath the waste management unit, and any other change to the environment due to the waste management unit.

3.2 WELL NETWORK AND GROUNDWATER ELEVATION MEASUREMENTS

3.2.1 Well Network

Based on the August 14, 2006 revision to the WDA post-closure care permit, the groundwater detection monitoring program for the WDA and municipal waste landfills at KRS consists of 21 groundwater monitoring wells that monitor 2 groundwater units. Each monitoring well network targets the preferential flowpath for the facility.

Detection Monitor Well Network

Monitored Zone	Upgradient Wells	Downgradient Wells
Benwood Limestone (Leachate Pond 3/4)	MW-301R	MW-302, MW-303R, MW-304, MW-307D, MW-310D, MW-310R, MW-311, MW-312R, MWPZ-1, MWPZ-2, MWPZ-3
Pittsburgh Coal	MW-201R	MW-204, MW-211R1
Lower Leachate Pond (Pittsburgh Coal)	MW-P1U	MW-P1D1R, MW-P1D2
Upper Leachate Pond (Pittsburgh Coal)	MW-P2U	MW-P2D1, MW-P2D2

3.2.2 Groundwater Elevation Measurements

Prior to initiation of groundwater purging and sampling activities, depth to water and water level elevation (feet above mean sea level) were recorded to the nearest hundredth of a foot. Water levels were collected from a total of 19 monitoring wells (MW-303R is a groundwater recovery well, and MW-P2U reference elevation is not available). The water level measurements are utilized in preparation of groundwater contour maps to determine groundwater flow direction and gradient at the site.

Water level data were collected from August 31 – September 1, 2010 using an electronic water level meter. Depth to groundwater was measured in each well and converted to elevations in feet above mean sea level (Table 2). Groundwater elevations for the 3rd Quarter 2010 sampling event are generally comparable to historical groundwater elevation measurements.

Using water levels measured on August 31 – September 1, 2010, potentiometric surface maps were prepared that depict a plan view of horizontal groundwater flow (Figures 2 and 3). Groundwater within the Benwood Hydrostratigraphic Unit generally flows to the south and southeast (Figure 2). Groundwater within the Pittsburgh Coal Hydrostratigraphic Unit generally flows to the south-southeast (Figure 3).

3.3 GROUNDWATER GRADIENT AND FLOW VELOCITY

The horizontal groundwater seepage velocity downgradient of the landfill was estimated using the following equation:

$$v = \frac{(K_h i)}{n_e}$$

Where:

- v = average groundwater velocity;
- K_h = aquifer horizontal conductivity;
- i = average hydraulic gradient; and
- n_e = effective aquifer porosity (Freeze and Cherry, 1979).

The potentiometric surface map (August 31 – September 1, 2010) of the Benwood Hydrostratigraphic Unit indicates that groundwater flow in this unit is from northwest to southeast with a horizontal gradient of 9.8×10^{-3} ft/ft (Figure 2). The average horizontal velocity of the Benwood Hydrostratigraphic Unit is 3.17×10^{-1} ft/day (115.7 ft/year), based upon an average hydraulic conductivity of 1.14×10^{-3} cm/sec (3.23 ft/day) (DEI, 1996a) and effective porosity of 10 percent (DEI, 1996a).

The potentiometric surface map (May 4 – 6, 2009) of the Pittsburgh Coal Hydrostratigraphic Unit indicates that groundwater flow in this unit is from north-northwest to south-southeast with a horizontal gradient of 9.0×10^{-3} ft/ft (Figure 3). The average horizontal groundwater velocity of the Pittsburgh Coal Hydrostratigraphic Unit is 1.89×10^{-1} ft/day (69 ft/year), based upon an average hydraulic conductivity of 7.42×10^{-4} cm/sec (2.103 ft/day) (DEI, 1996b) and effective porosity of 10 percent (DEI, 1996b). Of note, 2nd Quarter 2009 water level measurements were used for groundwater velocity calculations in the Pittsburgh Coal Hydrostratigraphic Unit since MW-201R has remained dry since the 3rd Quarter 2009.

3.4 SAMPLING AND ANALYTICAL PROGRAM

3.4.1 Field Program

Field sampling activities for the groundwater monitoring wells for the 3rd Quarter 2010 were conducted August 31 – September 1, 2010 (Tables 1 and 2). Monitoring well purging and sampling activities were implemented in accordance with the site's Groundwater Sampling and Analysis Plan and site permit. Wells were purged and sampled using dedicated pump systems or hand bailers (Appendix C).

3.4.2 Laboratory Analysis and Monitoring Parameters

As described in the municipal site's Groundwater Sampling and Analysis Plan (CE Consultants, 1995) and the WDA's Groundwater Monitoring and Reporting Plan (MFG, Inc., 2003), the KRS Landfill monitoring list was selected based on an evaluation of site-specific information including background groundwater chemistry, leachate analytical results, and chemical detectability, mobility, and persistence. Monitoring wells

at the site are analyzed for PADEP Form 19 constituents and additional parameters at select wells in accordance with the recently revised (August 14, 2006) post-closure permit for the WDA.

DETECTION MONITORING
PADEP FORM 19 QUARTERLY CONSTITUENTS

INORGANIC AND GENERAL CHEMISTRY

Alkalinity, total*	Iron	Sodium*
Ammonia-nitrogen*	Magnesium*	Sulfate*
Bicarbonate (as $CaCO_3$)*	Manganese*	Total Organic Carbon*
Calcium*	Nitrate-Nitrogen	Total Dissolved Solids*
Chemical Oxygen Demand*	pH, Field & Laboratory*	Total Phenolics
Chloride*	Potassium*	Turbidity
Fluoride	Specific conductance,	
	Field & Laboratory*	* Indicator analyte

ORGANIC CHEMISTRY

Benzene	*cis*-1,2-Dichloroethene	Toluene
1,2-Dibromoethane	*trans*-1,2-Dichloroethene	1,1,1-Trichloroethane
1,1-Dichloroethane	Ethyl benzene	Trichloroethene
1,1-Dichloroethene	Methyl chloride	Vinyl chloride
1,2-Dichloroethane	Tetrachloroethene	Xylene

ADDITIONAL CONSTITUENTS FOR: MW-201, MW-204, MW-211R1, MW-P2U, MW-301R, MW-302R, MW-303R, MW-304, MW-307, MW-310R, MW-311D, AND MW-312R

QUARTERLY PARAMETERS	ANNUAL PARAMETERS
Total Organic Halogen	Lead
Chromium	Arsenic
Naphthalene	Aluminum
Creosote	Cyanide

ADDITIONAL CONSTITUENTS FOR: MW-PZ-1, MW-PZ-2, AND MW-PZ-3

QUARTERLY PARAMETER	SEMI-ANNUAL PARAMETER
Total Organic Halogen	Naphthalene

All water samples collected at the site were delivered to Geochemical Testing, Inc. in Somerset, PA for chemical analysis. Geochemical Testing is certified in the Commonwealth of Pennsylvania for performing chemical analysis of the reported parameters. Original laboratory reports detail specific reporting limits (Appendices A, B, and C).

3.5 ANALYTICAL PROGRAM RESULTS

The 3rd Quarter 2010 sampling event was performed August 31 – September 1, 2010. Eleven wells were sampled for Form 19 parameters. Twelve wells were sampled for WDA Post-Closure parameters. Additional constituents were analyzed for several Benwood Limestone and Pittsburgh Coal monitoring wells. One field duplicate, one field blank, and two trip blanks were also collected.

3.6 GEOCHEMICAL ANALYSIS

KRS submits a quarterly report that discusses groundwater quality from all of the monitoring wells specified in the PADEP approved permit. The permit requires quarterly sampling for Form 19 parameters and time-series evaluation of leachate indicator parameters. The time versus concentration plots were analyzed for significant trends of a given constituent, unexpected geochemical signatures, and anomalously high results.

3.6.1 Volatile Organic Compounds

The Benwood Limestone Hydrostratigraphic Unit has been shown to contain BTEX and naphthalene through several assessment reports (DEI, 1996a) and remediation of the aquifer was also addressed in a 1996 Consent Order and the August 14, 2006 WDA Permit. Further, Benwood Limestone groundwater monitoring well MW-303R is a recovery well that has operated as part of the remediation of the groundwater since 1996.

Several volatile organic compounds have historically been detected in Benwood Limestone groundwater monitoring wells. For the 3rd Quarter 2010 sampling event, benzene was detected in MW-302R (49.5 μg/L) and MW-303R (52 μg/L), and ethylbenzene was detected in MW-303R (5.9 μg/L). Concentrations for each of the detections are within historical levels for each monitoring point. Volatile organic compounds were not detected above established reporting limits in any other wells.

3.6.2 Time-Series Analysis

The time versus concentration plots of five leachate indicator parameters (ammonia nitrogen, alkalinity, total dissolved solids, chloride, and sodium) were analyzed for significant trends, unexpected geochemical signatures, and anomalously high results.

3.6.2.1 Benwood - As shown on the time-series chart (Figure 4), no significant upward trend in the concentration of any indicator parameter was noted for the Benwood Hydrostratigraphic Unit. Geochemical analyses show that groundwater from the Benwood is a calcium bicarbonate (MW-304) to a sodium chloride (MW-311 and MW-312) dominant water type which is roughly consistent with that observed from previous studies (e.g., DEI, 1996a) (1st Quarter 2010: Figures 7 and 8).

3.6.2.2 Pittsburgh Coal - As shown on the time-series chart (Figure 5), no significant upward trend in the concentration of any indicator parameter was noted for the Pittsburgh Coal Hydrostratigraphic Unit except ammonia nitrogen, alkalinity, and sodium at MW-211R1, and alkalinity and sodium at MW-204. However, concentrations for alkalinity and sodium at MW-204, and all five leachate indicator parameters at MW-211R1 appear to fluctuate seasonally. In addition, since the concentrations of sodium, chloride, and total dissolved solids are higher at MW-211R1 than that of leachate, trends observed at this monitoring well do not appear to be the result of a leachate influence. Groundwater from the Pittsburgh Coal can generally be characterized as a calcium bicarbonate (MW-204) to sodium chloride (MW-211R1) water type (1st Quarter 2010: Figures 9 and 10). Monitoring point MW-201R was dry during the 3rd Quarter 2010 sampling event.

3.6.2.3 Leachate Pond Wells - No significant upward trend in the concentration of any indicator parameter was noted for the Pittsburgh Coal Hydrostratigraphic Unit in the lower and upper leachate pond areas except a slight increasing trend for total dissolved solids at MW-P2U (Figure 6). However, groundwater chemistry at MW-P2U differs from leachate, and groundwater from this portion of the Pittsburgh Coal characterizes, in general, as a calcium-bicarbonate to calcium-sulfate type of water (1st Quarter 2010: Figures 11 and 12).

3.6.2.4 Lysimeters - Two lysimeter sets (ML-1A and ML-2A) are located beneath the first two stages of the Phase III Area and are monitored for the presence of water. No water was detected in these lysimeters for the 3rd Quarter 2010 sampling event indicating that the liner system is not leaking into the subsurface (Table 1).

3.6.3 Surface Water Analysis

Five surface water samples (FTR-2, ST-2, ST-3, ST-5, and SP-3) were collected August 31, 2010 for Form 19 analysis (KR-2 and SP-4 were dry) in accordance with the revised Groundwater Monitoring and Reporting Plan approved with the August 14, 2006 WDA Permit. The SP-series surface water points monitor the Benwood which crops out along the southern portion of the landfill. Surface water points ST-2 and FTR-2 monitor Fallen Timber Run. Surface water point KR-2 monitors an unnamed tributary to Fallen Timber Run. Surface point ST-3 monitors an unnamed tributary upstream of ST-2, and ST-5 is upgradient of ST-3 on the unnamed tributary to Fallen Timber Run.

Analyses were generally consistent with the historical data for these monitoring points. Volatile organic compounds were not detected in any surface water samples for the 3rd Quarter 2010.

4.0 LABORATORY AND FIELD QUALITY ASSURANCE AND QUALITY CONTROL

4.1 TRIP, FIELD, AND EQUIPMENT BLANKS

Two trip blanks, one field blank, and one duplicate sample were collected as part of the field sampling and analysis quality control/quality assurance activities. The field blank and trip blanks did not detect any constituents that would place the sampling event into question.

4.2 HOLDING TIMES

All samples submitted to Geochemical Testing were analyzed within the required holding times as determined by the analytical method.

4.3 SAMPLE SURROGATE RECOVERIES

Sample recovery analyses are performed with each quarterly event and reported annually with the first quarter event. However, if results are not within acceptable ranges, notification would be included in the Quality Assurance Project Report prepared by Geochemical Testing (Appendix C).

4.4 METHOD BLANKS

No laboratory method blanks contained detectable concentrations of any constituents that would place the laboratory analyses into question (Appendix C).

4.5 LABORATORY CONTROL SPIKES

Laboratory control spikes for all analytical methods are performed with each quarterly event and reported annually with the first quarter event. However, if results are not within advisory limits, notification would be included in the Quality Assurance Project Report prepared by Geochemical Testing (Appendix C).

4.6 INITIAL CALIBRATION, CONTINUING CALIBRATION, AND INTERNAL MACHINE STANDARDS

Laboratory calibration is performed with each quarterly event and reported annually with the first quarter event. However, if results are not within acceptable limits, notification would be included in the Quality Assurance Project Report prepared by Geochemical Testing (Appendix C).

4.7 DUPLICATE SAMPLES

Duplicate sample analysis results were generally consistent with the corresponding original sample results.

5.0 CONCLUSIONS

Samples were collected at KRS according to appropriate sampling procedures for Form 19 and Form 50 parameters and sent to Geochemical Testing in Somerset, PA. The following observations are noted for the 3rd Quarter 2010 sampling event:

- The active and closed areas of KRS are underlain by two monitored hydrostratigraphic units: Benwood Limestone and the Pittsburgh Coal.
- KRS was sampled for Form 19 groundwater and surface water constituents on August 31 – September 1, 2010.
- Several Benwood groundwater monitoring points were sampled for additional parameters in accordance with the August 14, 2006 WDA Permit.
- KRS leachate was sampled for Form 50 constituents on August 31, 2010.
- The Benwood Limestone Hydrostratigraphic Unit has a horizontal gradient to the south of 9.8×10^{-3} ft/ft, with a velocity of 0.317 ft/day (115.7 ft/year) (Figure 2).
- The Pittsburgh Coal Hydrostratigraphic Unit has a horizontal gradient to the south of 9.0×10^{-3} ft/ft, with a velocity of 0.189 ft/day (69 ft/year) (Figure 3).
- Volatile organic compounds were detected in Benwood Limestone groundwater monitoring wells MW-302R and MW-303R. Volatile organic compounds were not detected above established reporting limits in other surface water or in other groundwater monitoring wells.
- Time-series analyses indicate that there are no increasing trends in the leachate indicator parameters in groundwater at Kelly Run Landfill except for alkalinity and sodium at MW-204; ammonia nitrogen, alkalinity, and sodium at MW-211R1; and a slight increasing trend for total dissolved solids at MW-P2U. However, these rises do not appear to be the result of a leachate influence.

Based on a review of recent and historical data collected during routine monitoring events at KRS, the following observations are made:

- Groundwater elevation contour maps show that local groundwater gradient and velocity have been temporally consistent in both monitored groundwater units.
- Concentrations of trace metals and other inorganic constituents in groundwater samples were generally consistent with historical concentrations.
- Surface water analyses of metals and inorganic parameter concentrations are generally consistent with historical concentrations (Appendix B). The Benwood Spring continues to be collected and treated as leachate due to historical detections of volatile organic compounds.
- The Benwood Limestone Hydrostratigraphic Unit has been shown to historically contain BTEX and naphthalene through several assessment reports (DEI, 1996a) and remediation of the aquifer was also addressed in a 1996 Consent Order and the August 14, 2006 WDA Permit. Benwood groundwater monitoring well MW-303R is a recovery well that has operated as part of Kelly Run's groundwater remediation efforts since 1996.

Therefore, the major conclusions of this report are:

1. Continued landfilling activities do not appear to be altering the existing groundwater conditions.
2. The groundwater monitoring network is capable of monitoring the Benwood and Pittsburgh Coal Hydrostratigraphic units.
3. The frequency of sampling and the constituents analyzed are appropriate for determining if a release has occurred.

6.0 REFERENCES

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TABLE 1

KELLY RUN LANDFILL
PADEP I.D. NO. 100663

THIRD QUARTER 2010
FIELD PARAMETERS

AQUIFER	MONITORING POINT	SAMPLE DATE	SAMPLE TIME	WATER LEVEL[1] (ft)	WELL DEPTH[1] (ft)	WATER VOLUME[2] (gallons)	THREE VOLUMES (gallons)	WATER PURGED (gallons)	VOLUMES PURGED	FIELD PARAMETERS pH	COND (µS/m)	TEMP (C)	COMMENTS
Benwood Limestone	MW-301R	08/31/2010	DRY	134.10	135.85	1.14	3.41						Insufficient Water to Sample
	MW-302R	08/31/2010	03:15 PM	149.70	170.26	13.36	40.09	3.00	0.22	6.00	8157	22.6	
	MW-303R	08/31/2010	12:05 PM	44.30	63.20	12.29	36.86	3.00	0.24	5.95	1255	15.9	
	MW-304	08/31/2010	11:20 AM	50.38	64.15	8.95	26.85	2.50	0.28	6.12	1272	13.9	
	MW-307D	08/31/2010	04:10 PM	157.90	168.20	6.69	20.09	2.00	0.30	6.50	3614	15.1	
	MW-310D	08/31/2010	DRY	DRY	128.84								Insufficient Water to Sample
	MW-310R	09/01/2010	11:55 AM	97.35	108.81	7.45	22.35	3.00	0.40	7.01	1348	17.8	
	MW-311	09/01/2010	09:55 AM	105.25	116.85	7.54	22.62	5.00	0.66	7.33	7740	13.5	
	MW-312R	09/01/2010	09:20 AM	169.72	182.65	8.40	25.21	5.00	0.59	6.32	6305	13.0	
	PZ-1	09/01/2010	08:45 AM	101.00	119.32	11.91	35.72	3.00	0.25	7.18	2660	14.4	
	PZ-2	08/31/2010	10:35 AM	110.85	129.45	12.09	36.27	4.00	0.33	7.27	2777	15.2	
	PZ-3	08/31/2010	10:55 AM	99.65	111.08	7.43	22.29	10.00	1.35	6.52	2690	15.3	
Pittsburgh Coal	MW-201R	08/31/2010	DRY	DRY	276.44								Insufficient Water to Sample
	MW-204	08/31/2010	03:50 PM	295.60	310.00	9.36	28.08	4.00	0.43	7.76	2017	17.8	
	MW-211R1	08/31/2010	01:30 PM	193.40	196.92	2.29	6.86	2.60	1.14	6.17	2061	18.8	
Lower	MW-P1U	08/31/2010	01:40 PM	19.40	36.75	11.28	33.83	16.00	1.42	6.89	1532	15.1	
Leachate	MW-P1D1	08/31/2010	02:35 PM	30.10	38.82	5.67	17.00	2.00	0.35	7.00	1269	15.8	
Pond	MW-P1D2	08/31/2010	01:05 PM	27.10	42.12	9.76	29.29	4.00	0.41	6.60	1291	13.6	
Upper	MW-P2U	09/01/2010	DRY	DRY	92.34								Dry
Leachate	MW-P2D1	09/01/2010	10:40 AM	93.85	96.50	1.72	5.17	1.30	0.75	6.27	936	15.7	
Pond	MW-P2D2	09/01/2010	11:20 AM	95.10	98.61	2.28	6.84	2.00	0.88	6.21	960	15.3	
Surface Water	KR-2	08/31/2010	DRY										Dry
	FTR-2	08/31/2010	10:30 AM							7.42	1689	17.9	
	ST-2	08/31/2010	10:05 AM							8.07	1065	19.7	
	ST-3	08/31/2010	10:15 AM							8.11	1666	20.1	
	ST-5	08/31/2010	09:40 AM							8.10	1369	20.1	
	SP-3	08/31/2010	11:30 AM							7.07	1238	19.4	
	SP-4	08/31/2010	DRY										Dry
Leachate	PHASE 1 DZ												Sampled Annually
	PHASE 2 DZ												Sampled Annually
	PHASE 3A DZ												Sampled Annually
	PHASE 3B DZ												Sampled Annually
	PHASE 1	08/31/2010	01:25 PM							6.60	8725	28.4	
	PHASE 2	08/31/2010	01:35 PM							7.04	5996	24.5	
	PHASE 3	08/31/2010	02:25 PM							6.56	13003	24.2	
	WDA LEACH.	08/31/2010	01:20 PM							6.31	1950	26.9	
Phase III Subgrade	ML-1A	09/01/2010	DRY										Lysimeter is Dry
Monitoring Pt.	ML-2A	09/01/2010	DRY										Lysimeter is Dry

Notes:
[1] Measured from top of inner casing.
[2] Calculated from 0.65 gallons per foot of water
Sampled by Cody Salmon, Aquascape
ft = feet

C = Degrees Centigrade
µS/m = microSiemens/meter
gpm = gallons per minute
N/A = Not Applicable
NP = Not Provided

TABLE 2

KELLY RUN LANDFILL
PADEP I.D. NO. 100663

THIRD QUARTER 2010
WATER-LEVEL ELEVATIONS

AQUIFER	MONITORING POINT	GRADIENT POSITION	MEASUREMENT DATE	MEASUREMENT POINT ELEV.[1] (ft amsl)	WATER LEVEL[2] (ft)	WATER LEVEL ELEV. (ft amsl)
Benwood Limestone	MW-301R	U	08/31/2010	1169.67	134.10	1035.57
	MW-302R	D	08/31/2010	1154.41	149.70	1004.71
	MW-303R[3]	D	08/31/2010	1653.57	44.30	1609.27
	MW-304	D	08/31/2010	1055.14	50.38	1004.76
	MW-307D	D	08/31/2010	1165.07	157.90	1007.17
	MW-310D	D	08/31/2010	1099.42	DRY	DRY
	MW-310R	D	09/01/2010	1099.39	97.35	1002.04
	MW-311	D	09/01/2010	1100.37	105.25	995.12
	MW-312R	D	09/01/2010	1171.46	169.72	1001.74
	PZ-1	D	09/01/2010	1119.32	101.00	1018.32
	PZ-2	D	08/31/2010	1135.94	110.85	1025.09
	PZ-3	D	08/31/2010	1124.39	99.65	1024.74
Pittsburgh Coal	MW-201R	U	08/31/2010	1158.13	DRY	DRY
	MW-204	D	08/31/2010	1163.25	295.60	867.65
	MW-211R1	D	08/31/2010	1064.00	193.40	870.60
Lower	MW-P1U	U	08/31/2010	892.73	19.40	873.33
Leachate	MW-P1D1	D	08/31/2010	891.18	30.10	861.08
Pond	MW-P1D2	D	08/31/2010	888.43	27.10	861.33
Upper	MW-P2U	U	09/01/2010	NA	DRY	NA
Leachate	MW-P2D1	D	09/01/2010	963.17	93.85	869.32
Pond	MW-P2D2	D	09/01/2010	963.17	95.10	868.07

Notes:

[1] Elevation for the top of the PVC from well logs.

[2] Measured from the top of the 4" PVC riser pipe. Measured by Cody Salmon, Aquascape

[3] Groundwater Recovery Well

ft = foot

ft amsl = feet above mean sea level.

NA = Not Available

NM = Not Measured

TABLE 3

KELLY RUN SANITATION LANDFILL
PA DEP I.D. NO. 100663

THIRD QUARTER 2010
RESULTS OF CHEMICAL ANALYSES PERFORMED ON GROUNDWATER AND SURFACE WATER

				GROUNDWATER										
Chemical Constituent	**Unit**	**Analytical Method No.**	**MCL**	**MW-201R**	**MW-204**	**MW-211R1**	**MW-301R**	**MW-302R**	**MW-303R**	**MW-304**	**MW-307**	**MW-310**	**MW-310R**	**MW-311**
Inorganics														
Ammonia Nitrogen	mg/L as N	EPA 350.1&D	NA	DRY	0.5	3.66	DRY			0.34		DRY	0.24	1.69
Bicarbonate	mg/L as CaCO3	SM 4500-CO2D	NA	DRY	604	439	DRY			671		DRY	564	1120
Calcium	mg/L	EPA 200.7	NA	DRY	40.7	86.8	DRY			168		DRY	46.3	24.1
Chemical Oxygen Demand	mg/L	HACH 8000	NA	DRY	26	13	DRY			< 10		DRY	33	150
Chloride	mg/L	EPA 300.0	250*	DRY	290	254	DRY	2160	25	5	495	DRY	105	2000
Fluoride	mg/L	EPA 300.0	4	DRY	0.2	< 0.1	DRY			< 0.1		DRY	0.2	< 1.0
Iron	mg/L	EPA 200.7	0.3*	DRY	4.75	27.9	DRY			< 0.05		DRY	1.1	0.9
Magnesium	mg/L	EPA 200.7	NA	DRY	34.4	36.5	DRY			88.1		DRY	33.3	13.2
Manganese	mg/L	EPA 200.7	0.05*	DRY	0.07	0.34	DRY			0.86		DRY	0.05	0.03
Nitrate Nitrogen	mg/L as N	EPA 300.0	10	DRY	2.04	0.06	DRY			0.13		DRY	0.11	0.68
pH, Field	su	FLD	NA	DRY	7.76	6.17	DRY	6	5.95	6.12	6.5	DRY	7.01	7.33
pH, Lab	su	SM4500-H+B	NA	DRY	8.23	6.68	DRY	6.67	6.85	7.99	7.22	DRY	7.83	8.1
Potassium	mg/L	EPA 200.7	NA	DRY	2.5	6.6	DRY			3.3		DRY	1.8	5.5
Sodium	mg/L	EPA 200.7	NA	DRY	416	332	DRY	1050	18.6	16.8	880	DRY	242	1970
Specific Conductance, Field	umhos/cm	FLD	NA	DRY	2017	2061	DRY	8157	1255	1272	3614	DRY	1348	7740
Specific Conductance, Lab	umhos/cm	EPA 120.1	NA	DRY	1980	1980	DRY	7880	1280	1250	3580	DRY	1400	7860
Sulfate	mg/L	EPA 300.0	250*	DRY	70	309	DRY	< 10J	20	114	< 10	DRY	91	< 10
Alkalinity to pH 4.5	mg/L as CaCO3	SM 18 2320B	NA	DRY	614	439	DRY			677		DRY	568	1140
Total dissolved solids	mg/L	SM2540-C	NA	DRY	1190	1290	DRY			820		DRY	876	4710
Total Organic Carbon	mg/L	SM 18 5310-C	NA	DRY	9	6.6	DRY	41.8	5.6	2.3	24.6	DRY	11.2	27.4
Phenolics, total	ug/L	EPA 420.1	4000	DRY	< 20.0	< 20.0	DRY	< 20.0	< 20.0	< 20.0	< 20.0	DRY	< 20.0	< 20.0
Turbidity	NTU	EPA 180.1	NA	DRY	141	213	DRY			0.9		DRY	6.8	31.7
Organics														
Benzene	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	DRY	49.5	52	< 5.0	< 5.0	DRY	< 5.0	< 5.0
1,2-Dibromoethane	ug/L	EPA 8260B	0.05	DRY	< 5.0	< 5.0	DRY			< 5.0		DRY	< 5.0	< 5.0
1,1-Dichloroethane	ug/L	EPA 8260B	27	DRY	< 5.0	< 5.0	DRY			< 5.0		DRY	< 5.0	< 5.0
1,1-Dichloroethene	ug/L	EPA 8260B	7	DRY	< 5.0	< 5.0	DRY			< 5.0		DRY	< 5.0	< 5.0
1,2-Dichloroethane	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	DRY			< 5.0		DRY	< 5.0	< 5.0
cis-1,2-Dichloroethene	ug/L	EPA 8260B	70	DRY	< 5.0	< 5.0	DRY			< 5.0		DRY	< 5.0	< 5.0
trans-1,2-Dichloroethene	ug/L	EPA 8260B	100	DRY	< 5.0	< 5.0	DRY			< 5.0		DRY	< 5.0	< 5.0
Ethylbenzene	ug/L	EPA 8260B	700	DRY	< 5.0	< 5.0	DRY	5.9	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0
Methylene Chloride	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	DRY			< 5.0		DRY	< 5.0	< 5.0
Tetrachloroethene	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	DRY			< 5.0		DRY	< 5.0	< 5.0
Toluene	ug/L	EPA 8260B	1000	DRY	< 5.0	< 5.0	DRY	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0
1,1,1-Trichloroethane	ug/L	EPA 8260B	200	DRY	< 5.0	< 5.0	DRY			< 5.0		DRY	< 5.0	< 5.0
Trichloroethene	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	DRY			< 5.0		DRY	< 5.0	< 5.0
Vinyl Chloride	ug/L	EPA 8260B	2	DRY	< 2.0	< 2.0	DRY			< 2.0		DRY	< 2.0	< 2.0
Total Xylene	ug/L	EPA 8260B	10000	DRY	< 5.0	< 5.0	DRY	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0
Additional Parameters														
Chromium	mg/L	EPA 200.7	0.10	DRY	< 0.01	< 0.01	DRY	0.11	< 0.01	< 0.01	< 0.01	DRY	< 0.01	< 0.01
Chromium, dissolved	mg/L	EPA 200.7D	0.10	DRY	< 0.01	< 0.01	DRY	< 0.01	< 0.01	< 0.01	< 0.01	DRY	< 0.01	< 0.01
Naphthalene	ug/L	EPA 8260B	100	DRY	< 5.0	< 5.0	DRY	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0
Total Organic Halogen	ug/L	EPA 9020B	NA	DRY	88	45	DRY	676	26	< 20	278	DRY	64	472

MCL = Maximum Contaminant Level (EPA Federal Drinking Water Standards or Pennsylvania DEP Statewide Health Standards for used aquifers in a residential setting where EPA Standard does not exist)
* These values represent secondary MCLs.
Dry Points: MW-201R, MW-301R, MW-310, MW-P2U, KR-2, SP-4

TABLE 3

KELLY RUN SANITATION LANDFILL
PA DEP I.D. NO. 100663

THIRD QUARTER 2010
RESULTS OF CHEMICAL ANALYSES PERFORMED ON GROUNDWATER AND SURFACE WATER

Chemical Constituent	Unit	Analytical Method No.	MCL	GROUNDWATER									
				MW-312	MW-P1U	MW-P1D1	MW-P1D2	MW-P2U	MW-P2D1	MW-P2D2	MWPZ-1	MWPZ-2	MWPZ-3
Inorganics													
Ammonia Nitrogen	mg/L as N	EPA 350.1&D	NA	22.1	0.29	0.45	< 0.10	DRY	0.12	< 0.10			
Bicarbonate	mg/L as CaCO3	SM 4500-CO2D	NA	1030	555	480	260	DRY	436	228			
Calcium	mg/L	EPA 200.7	NA	170	163	157	111	DRY	131	124			
Chemical Oxygen Demand	mg/L	HACH 8000	NA	210	< 10	< 10	< 10	DRY	11	< 10			
Chloride	mg/L	EPA 300.0	250*	1720	78	76	49	DRY	99	51	152	147	166
Fluoride	mg/L	EPA 300.0	4	< 0.1	0.1	0.1	0.2	DRY	< 0.1	0.2			
Iron	mg/L	EPA 200.7	0.3*	1.36	< 0.05	1.41	< 0.05	DRY	0.21	< 0.05			
Magnesium	mg/L	EPA 200.7	NA	91.8	47	44.3	39.7	DRY	35.8	42.6			
Manganese	mg/L	EPA 200.7	0.05*	0.04	1.23	0.23	< 0.01	DRY	0.92	< 0.01			
Nitrate Nitrogen	mg/L as N	EPA 300.0	10	0.43	0.08	0.08	< 0.05	DRY	0.1	0.26			
pH, Field	su	FLD	NA	6.32	6.89	7	6.6	DRY	6.27	6.21	7.18	7.27	6.52
pH, Lab	su	SM4500-H+B	NA	7.05	7.41	7.56	7.2	DRY	7.15	7.39	7.95	7.94	7.18
Potassium	mg/L	EPA 200.7	NA	19.2	3.7	2.4	3.5	DRY	2.3	3.7			
Sodium	mg/L	EPA 200.7	NA	1190	149	72.4	38.3	DRY	118	34.8	704	753	628
Specific Conductance, Field	umhos/cm	FLD	NA	6305	1532	1269	1291	DRY	935.9	959.9	2660	2777	2690
Specific Conductance, Lab	umhos/cm	EPA 120.1	NA	6450	1560	1310	992	DRY	1290	1000	2660	2770	2630
Sulfate	mg/L	EPA 300.0	250*	< 10	265	164	222	DRY	122	280	< 10	< 10	< 10
Alkalinity to pH 4.5	mg/L as CaCO3	SM 18 2320B	NA	1030	556	482	260	DRY	437	229			
Total dissolved solids	mg/L	SM2540-C	NA	3660	1040	840	654	DRY	802	692			
Total Organic Carbon	mg/L	SM 18 5310-C	NA	54.5	2.4	2.7	1.7	DRY	3.7	1.5	6.5	6.8	12.5
Phenolics, total	ug/L	EPA 420.1	4000	< 20.0	< 20.0	< 20.0	< 20.0	DRY	< 20.0	< 20.0			
Turbidity	NTU	EPA 180.1	NA	23.7	18.1	22.3	0.6	DRY	3.1	0.3			
Organics													
Benzene	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dibromoethane	ug/L	EPA 8260B	0.05	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
1,1-Dichloroethane	ug/L	EPA 8260B	27	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
1,1-Dichloroethene	ug/L	EPA 8260B	7	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
1,2-Dichloroethane	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
cis-1,2-Dichloroethene	ug/L	EPA 8260B	70	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
trans-1,2-Dichloroethene	ug/L	EPA 8260B	100	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
Ethylbenzene	ug/L	EPA 8260B	700	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Methylene Chloride	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
Tetrachloroethene	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
Toluene	ug/L	EPA 8260B	1000	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1,1-Trichloroethane	ug/L	EPA 8260B	200	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
Trichloroethene	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
Vinyl Chloride	ug/L	EPA 8260B	2	< 2.0	< 2.0	< 2.0	< 2.0	DRY	< 2.0	< 2.0			
Total Xylene	ug/L	EPA 8260B	10000	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Additional Parameters													
Chromium	mg/L	EPA 200.7	0.10	< 0.01				DRY					
Chromium, dissolved	mg/L	EPA 200.7D	0.10	< 0.01				DRY					
Naphthalene	ug/L	EPA 8260B	100	< 5.0				DRY			< 5.0	< 5.0	< 5.0
Total Organic Halogen	ug/L	EPA 9020B	NA	578				DRY			43	85	88

MCL = Maximum Contaminant Level (EPA Federal Drinking Water Standards or Pennsylvania DEP Statewide Health Standards for used aquifers in a residential setting where EPA Standard does not exist)
* These values represent secondary MCLs.
Dry Points: MW-201R, MW-301R, MW-310, MW-P2U, KR-2, SP-4

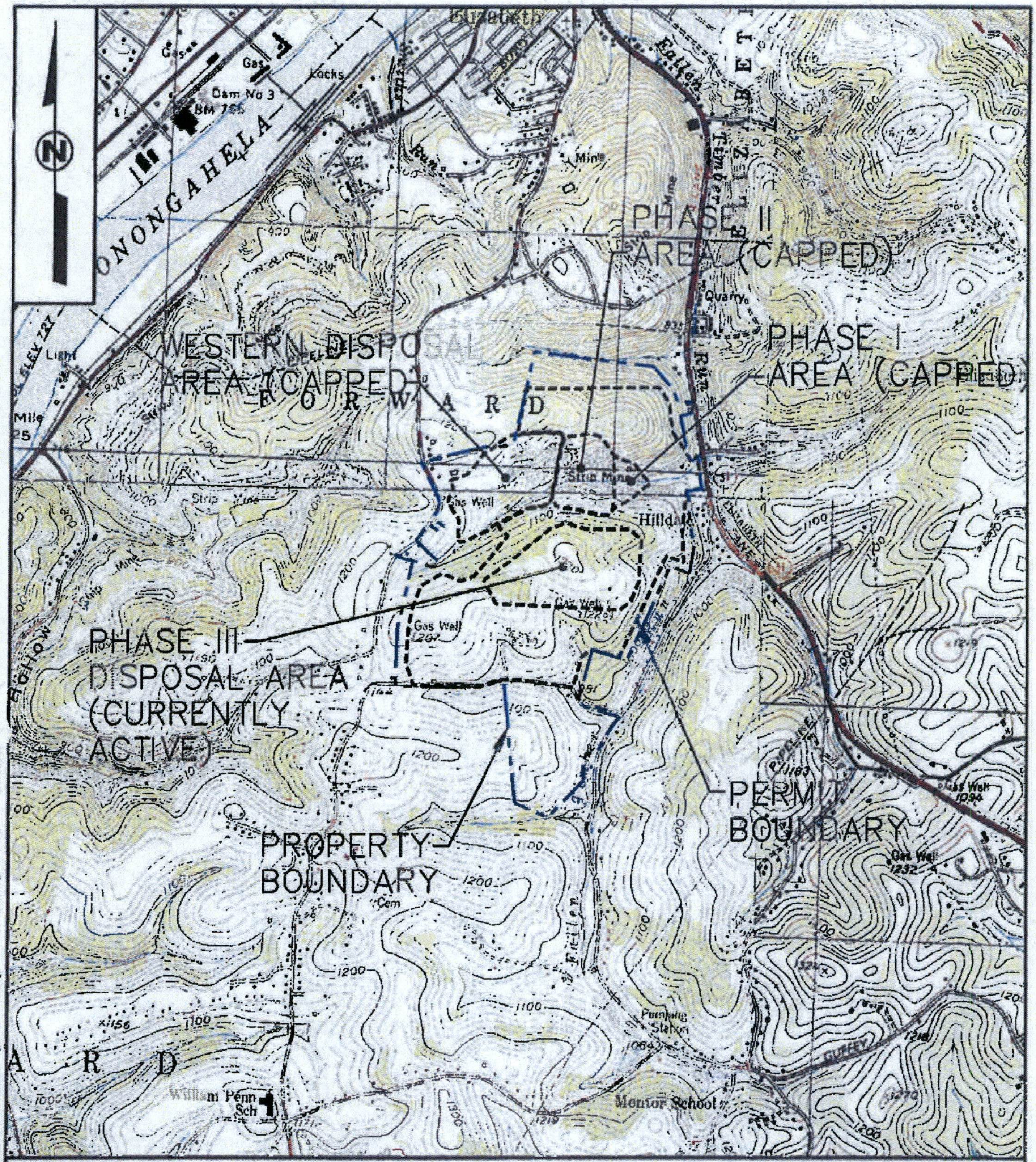
TABLE 3

KELLY RUN SANITATION LANDFILL
PA DEP I.D. NO. 100663

THIRD QUARTER 2010
RESULTS OF CHEMICAL ANALYSES PERFORMED ON GROUNDWATER AND SURFACE WATER

				SURFACE WATER						
Chemical Constituent	**Unit**	**Analytical Method No.**	**MCL**	**KR-2**	**FTR-2**	**ST-2**	**ST-3**	**ST-5**	**SP-3**	**SP-4**
Inorganics										
Ammonia Nitrogen	mg/L as N	EPA 350.1&D	NA	DRY	1.68	< 0.10	< 0.10	< 0.10	< 0.10	DRY
Bicarbonate	mg/L as CaCO3	SM 4500-CO2D	NA	DRY	199	275	327	231	415	DRY
Calcium	mg/L	EPA 200.7	NA	DRY	120	99.8	110	140	131	DRY
Chemical Oxygen Demand	mg/L	HACH 8000	NA	DRY	< 10	< 10	< 10	< 10	< 10	DRY
Chloride	mg/L	EPA 300.0	250*	DRY	88	120	289	196	56	DRY
Fluoride	mg/L	EPA 300.0	4	DRY	0.2	0.2	< 0.1	0.1	< 0.1	DRY
Iron	mg/L	EPA 200.7	0.3*	DRY	7.38	0.11	0.25	0.11	0.15	DRY
Magnesium	mg/L	EPA 200.7	NA	DRY	40.1	32.9	63.4	47.8	93.5	DRY
Manganese	mg/L	EPA 200.7	0.05*	DRY	0.41	< 0.01	0.05	0.02	0.1	DRY
Nitrate Nitrogen	mg/L as N	EPA 300.0	10	DRY	0.11	0.21	1.27	1.48	0.97	DRY
pH, Field	su	FLD	NA	DRY	7.42	8.07	8.11	8.1	7.07	DRY
pH, Lab	su	SM4500-H+B	NA	DRY	7.92	8.32	8.34	8.32	7.7	DRY
Potassium	mg/L	EPA 200.7	NA	DRY	3.3	3.8	4.2	2	3.1	DRY
Sodium	mg/L	EPA 200.7	NA	DRY	246	72.9	189	98.9	32.8	DRY
Specific Conductance, Field	umhos/cm	FLD	NA	DRY	1689	1065	1666	1369	1238	DRY
Specific Conductance, Lab	umhos/cm	EPA 120.1	NA	DRY	1700	977	1660	1330	1230	DRY
Sulfate	mg/L	EPA 300.0	250*	DRY	610	64	136	187	231	DRY
Alkalinity to pH 4.5	mg/L as CaCO3	SM 18 2320B	NA	DRY	201	280	334	236	417	DRY
Total dissolved solids	mg/L	SM2540-C	NA	DRY	1230	568	998	850	834	DRY
Total Organic Carbon	mg/L	SM 18 5310-C	NA	DRY	1	2.6	3.9	1.4	2.2	DRY
Phenolics, total	ug/L	EPA 420.1	4000	DRY	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0	DRY
Turbidity	NTU	EPA 180.1	NA	DRY	57	7.9	24.6	3.6	5	DRY
Organics										
Benzene	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,2-Dibromoethane	ug/L	EPA 8260B	0.05	DRY	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,1-Dichloroethane	ug/L	EPA 8260B	27	DRY	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,1-Dichloroethene	ug/L	EPA 8260B	7	DRY	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,2-Dichloroethane	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
cis-1,2-Dichloroethene	ug/L	EPA 8260B	70	DRY	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
trans-1,2-Dichloroethene	ug/L	EPA 8260B	100	DRY	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Ethylbenzene	ug/L	EPA 8260B	700	DRY	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Methylene Chloride	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Tetrachloroethene	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Toluene	ug/L	EPA 8260B	1000	DRY	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,1,1-Trichloroethane	ug/L	EPA 8260B	200	DRY	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Trichloroethene	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Vinyl Chloride	ug/L	EPA 8260B	2	DRY	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	DRY
Total Xylene	ug/L	EPA 8260B	10000	DRY	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Additional Parameters										
Chromium	mg/L	EPA 200.7	0.10							DRY
Chromium, dissolved	mg/L	EPA 200.7D	0.10							DRY
Naphthalene	ug/L	EPA 8260B	100							DRY
Total Organic Halogen	ug/L	EPA 9020B	NA							DRY

MCL = Maximum Contaminant Level (EPA Federal Drinking Water Standards or Pennsylvania DEP Statewide Health Standards for used aquifers in a residential setting where EPA Standard does not exist)
* These values represent secondary MCLs.
Dry Points: MW-201R, MW-310R, MW-P2U, SP-4



REFERENCE
U.S.G.S. 7.5 MINUTE TOPOGRAPHIC QUADRANGLE MAPS OF GLASSPORT, MCKESSPORT, MONOGAHELA AND DONORA, PA

SCALE
2000 0 2000 FT.

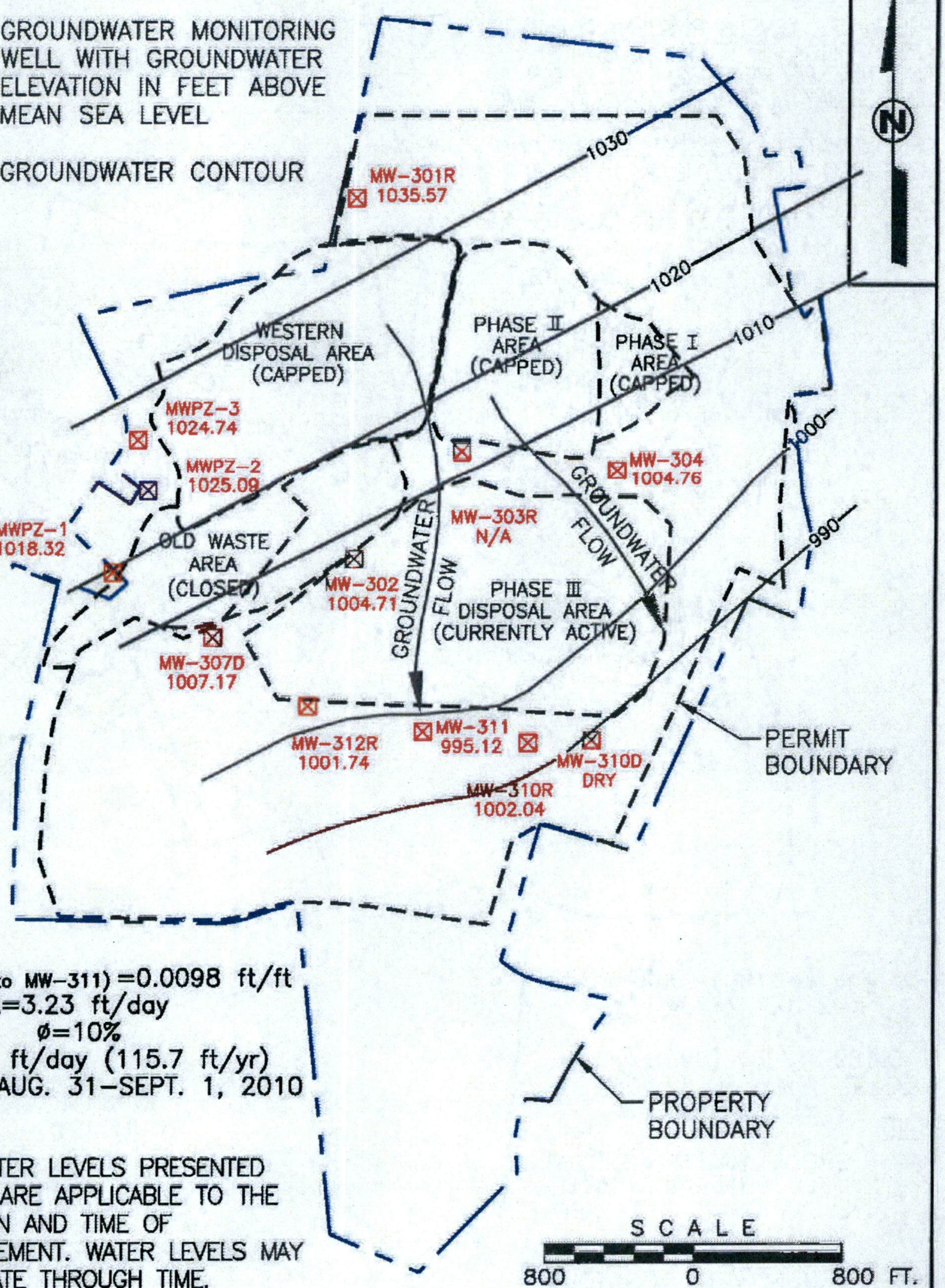
CEC Civil & Environmental Consultants, Inc. EXPORT, PA PITTSBURGH, PA (724) 327-5200 • (412) 429-2324 Cincinnati, OH • Columbus, OH • Indianapolis, IN • Nashville, TN	U.S.G.S. SITE LOCATION MAP KELLY RUN LANDFILL PERMIT NO. 100663

DWN. BY: JHG CHKD. BY: RST	SCALE: AS SHOWN	DATE: 08/19/05	PROJECT NO.: 050558	FIGURE NO. 1

LEGEND

MW-304 1004.76 — GROUNDWATER MONITORING WELL WITH GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL

1020 — GROUNDWATER CONTOUR



i (MW-302 to MW-311) =0.0098 ft/ft
k=3.23 ft/day
ø=10%
V=0.317 ft/day (115.7 ft/yr)
MEASURED AUG. 31-SEPT. 1, 2010

NOTE:

1. THE WATER LEVELS PRESENTED HEREIN ARE APPLICABLE TO THE LOCATION AND TIME OF MEASUREMENT. WATER LEVELS MAY FLUCTUATE THROUGH TIME.

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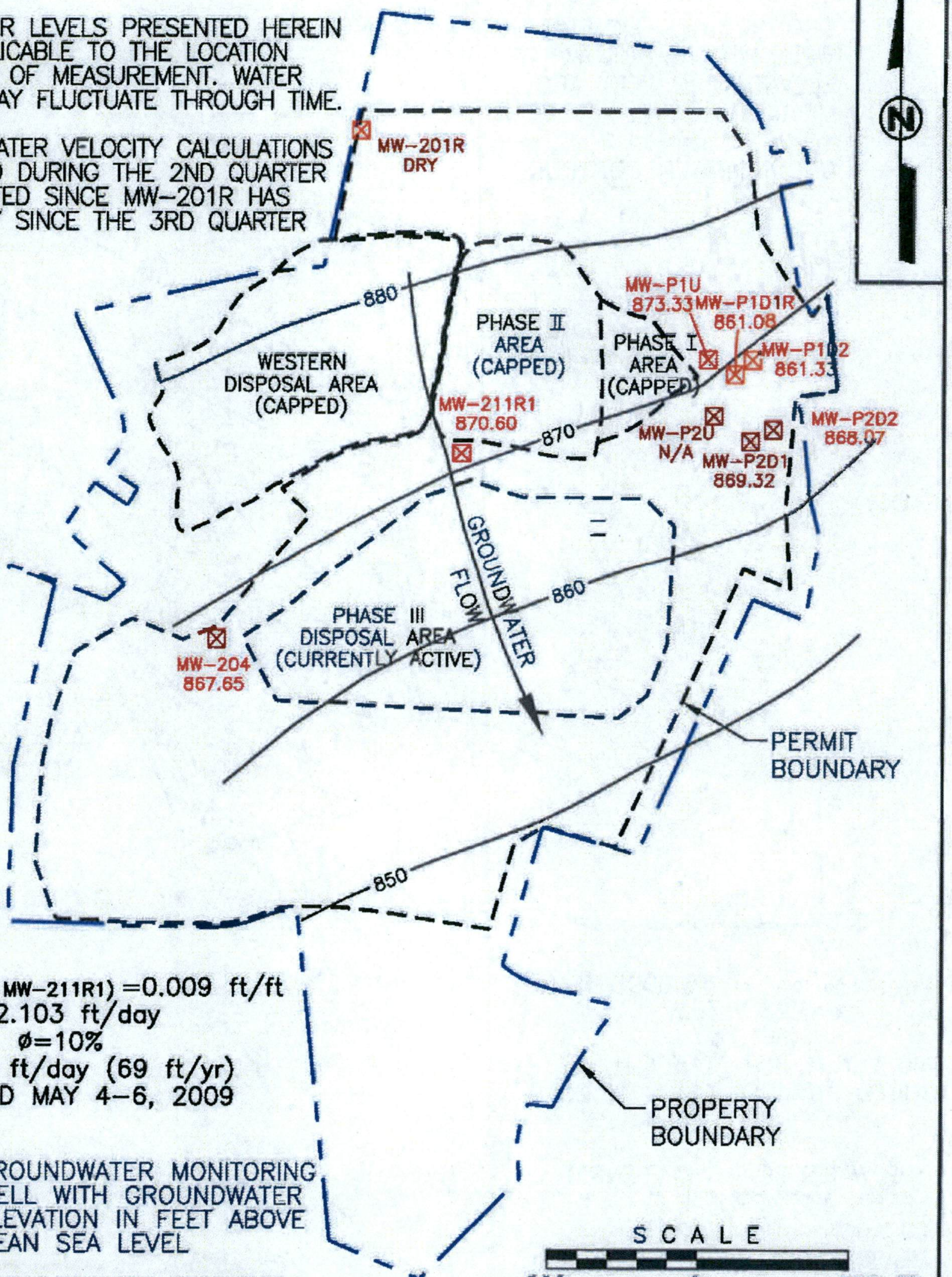
BENWOOD LIMESTONE
POTENTIOMETRIC MAP
KELLY RUN LANDFILL
PERMIT NO. 100663

DWN. BY: JHG	SCALE:	DATE:	PROJECT NO.:	
CHKD. BY: LJ4	AS SHOWN	11/09/10	050-558.0310	FIGURE NO. 2

G:\PROJECTS\2005\050558\DWG\050558452.DWG{MODEL} (JGILLIGAN) - NOV 9, 2010 - 15:6:20

NOTE:

1. THE WATER LEVELS PRESENTED HEREIN ARE APPLICABLE TO THE LOCATION AND TIME OF MEASUREMENT. WATER LEVELS MAY FLUCTUATE THROUGH TIME.
2. GROUNDWATER VELOCITY CALCULATIONS MEASURED DURING THE 2ND QUARTER 2009 LISTED SINCE MW-201R HAS BEEN DRY SINCE THE 3RD QUARTER 2009.



$i_{(MW-201R \text{ to } MW-211R1)} = 0.009$ ft/ft
$k = 2.103$ ft/day
$\phi = 10\%$
$V = 0.189$ ft/day (69 ft/yr)
MEASURED MAY 4–6, 2009

LEGEND

MW-P2D1 869.32 — GROUNDWATER MONITORING WELL WITH GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL

—870— GROUNDWATER CONTOUR

SCALE
800 0 800 FT.

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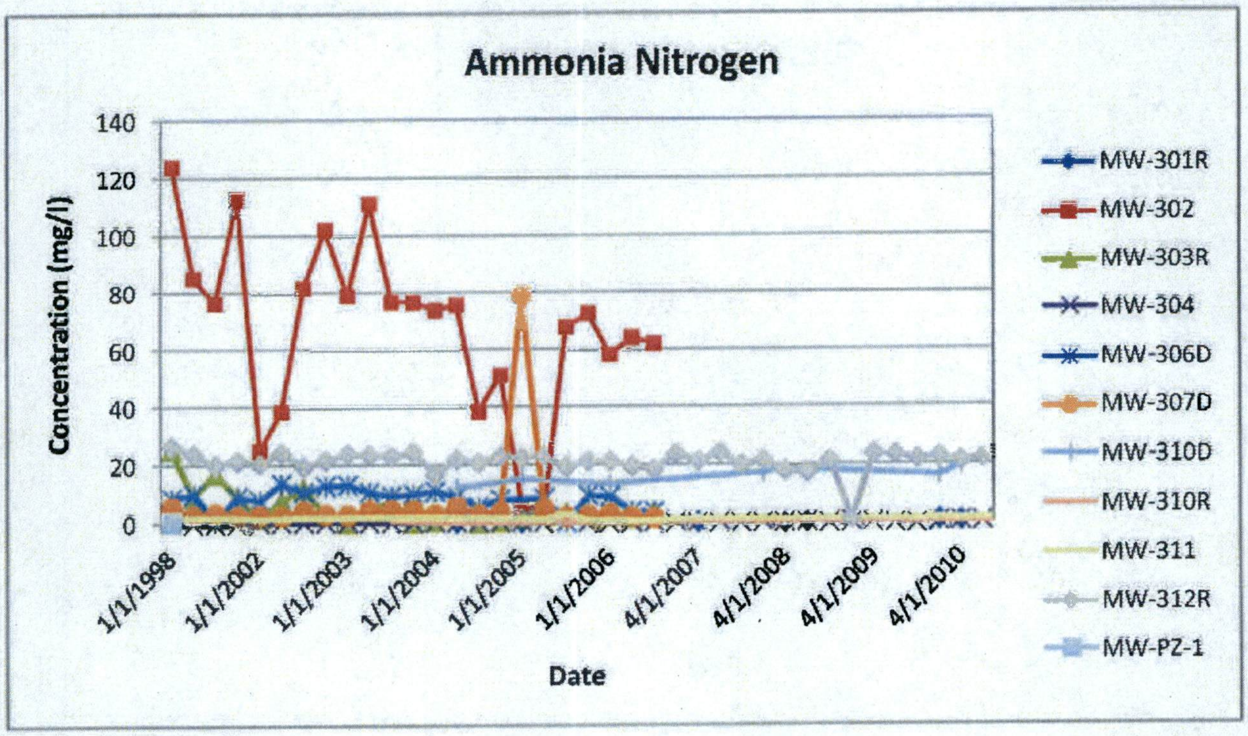
PITTSBURGH COAL
POTENTIOMETRIC MAP
KELLY RUN LANDFILL
PERMIT NO. 100663

DWN. BY: JHG	SCALE:	DATE:	PROJECT NO.:	
CHKD. BY: RST	AS SHOWN	11/09/10	050-558.0310	FIGURE NO. 3

G:\PROJECT\05\050558\DWG\05055853.DWG{MODEL} (JGILLIGAN) - NOV 9, 2010 - :10:5

FIGURE 4

KELLY RUN SANITATION, INC
BENWOOD LIMESTONE
TIME SERIES PLOTS



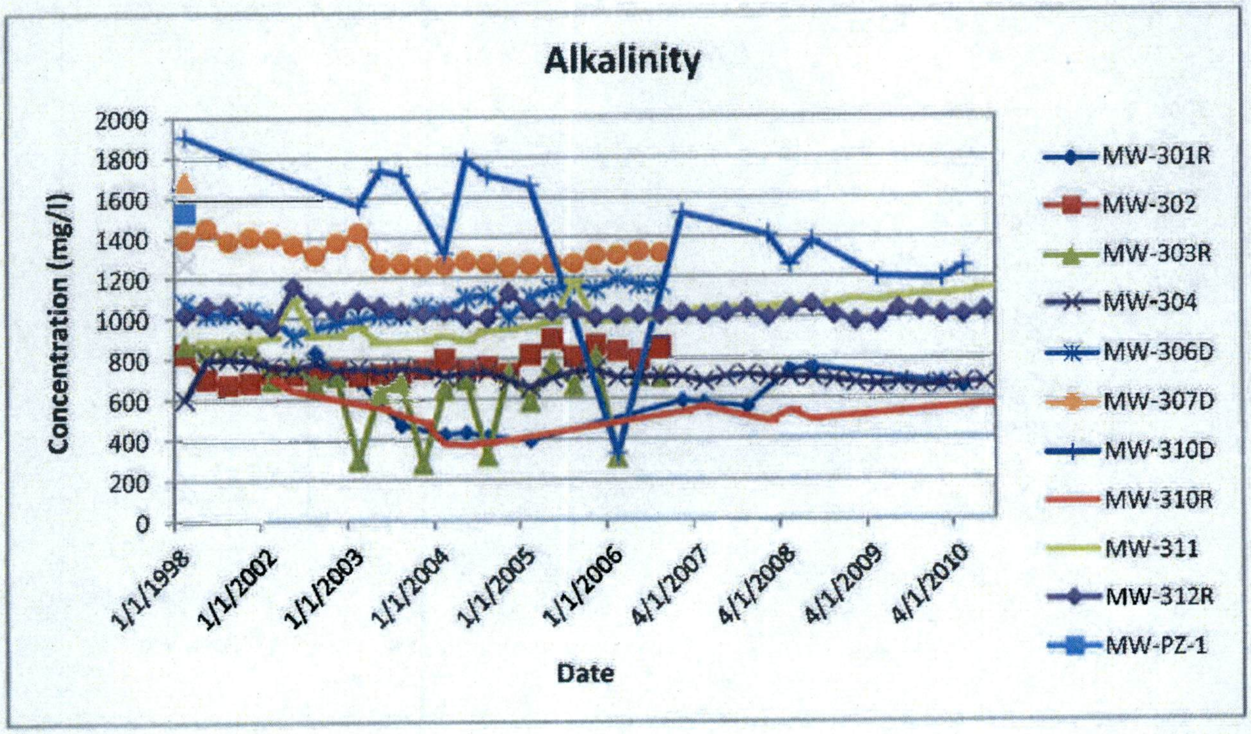
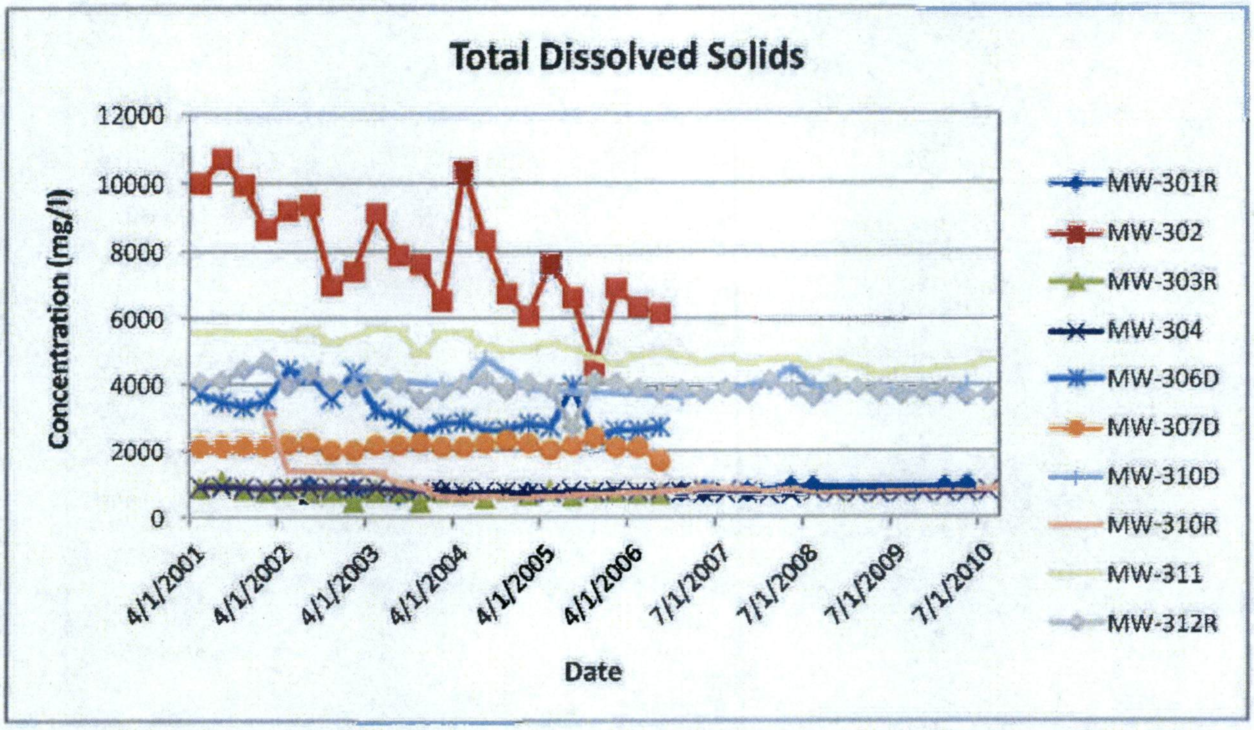


FIGURE 4

KELLY RUN SANITATION, INC
BENWOOD LIMESTONE
TIME SERIES PLOTS



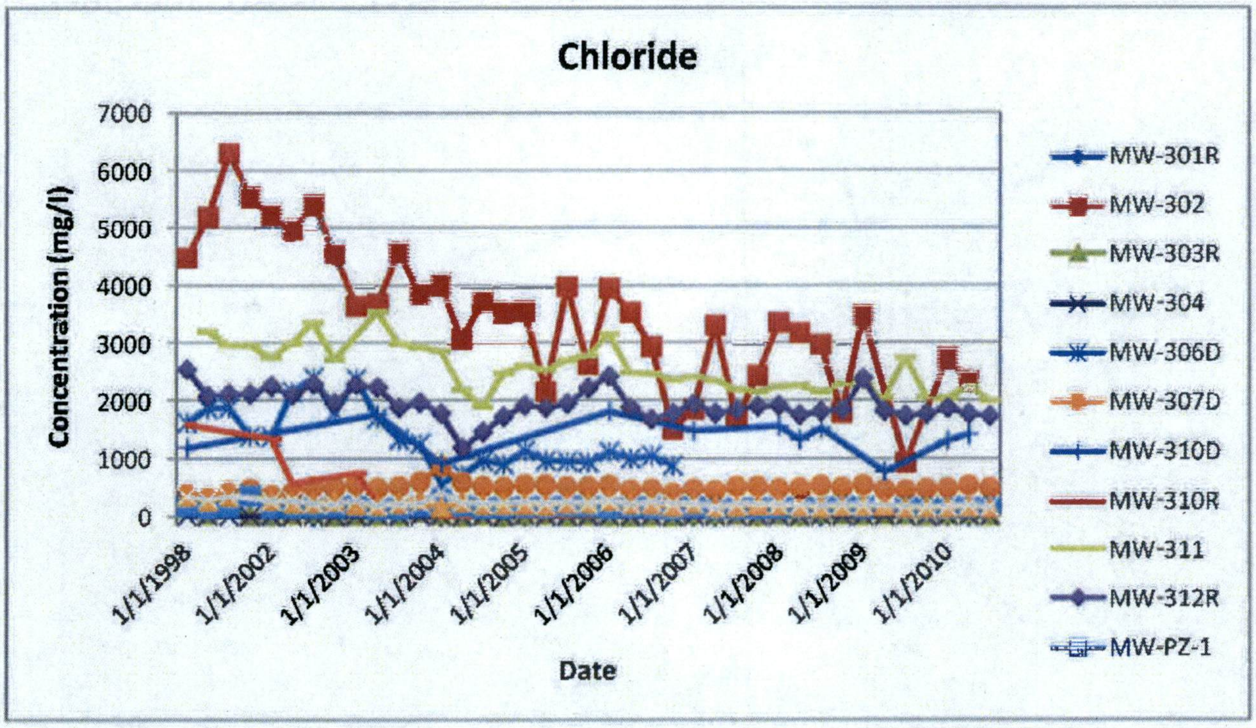


FIGURE 4

KELLY RUN SANITATION, INC
BENWOOD LIMESTONE
TIME SERIES PLOTS

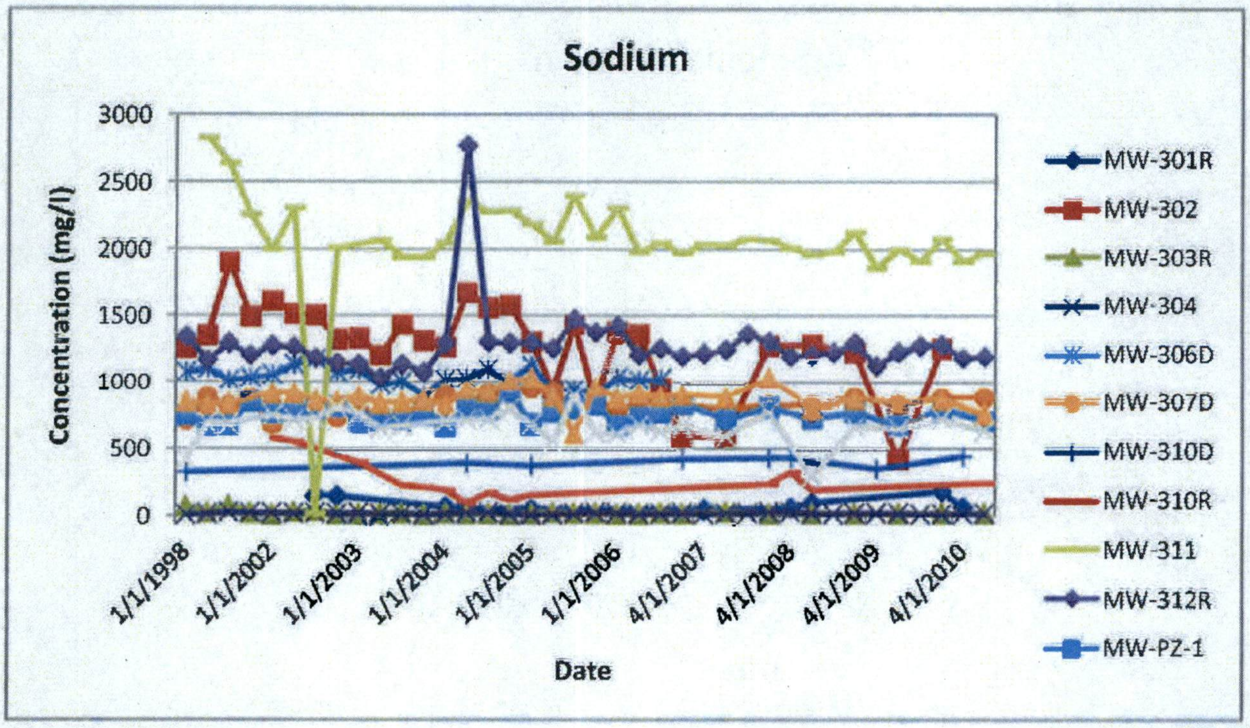
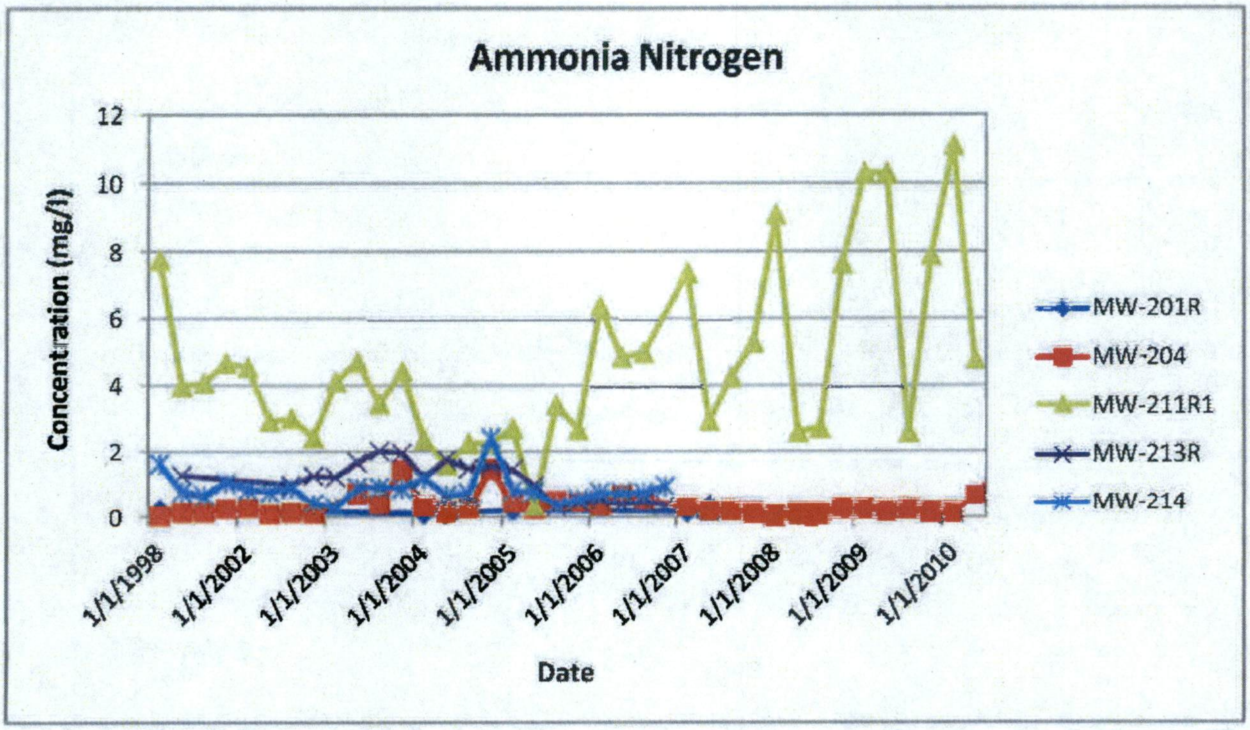


FIGURE 5

KELLY RUN SANITATION, INC
PITTSBURGH COAL
TIME SERIES PLOTS



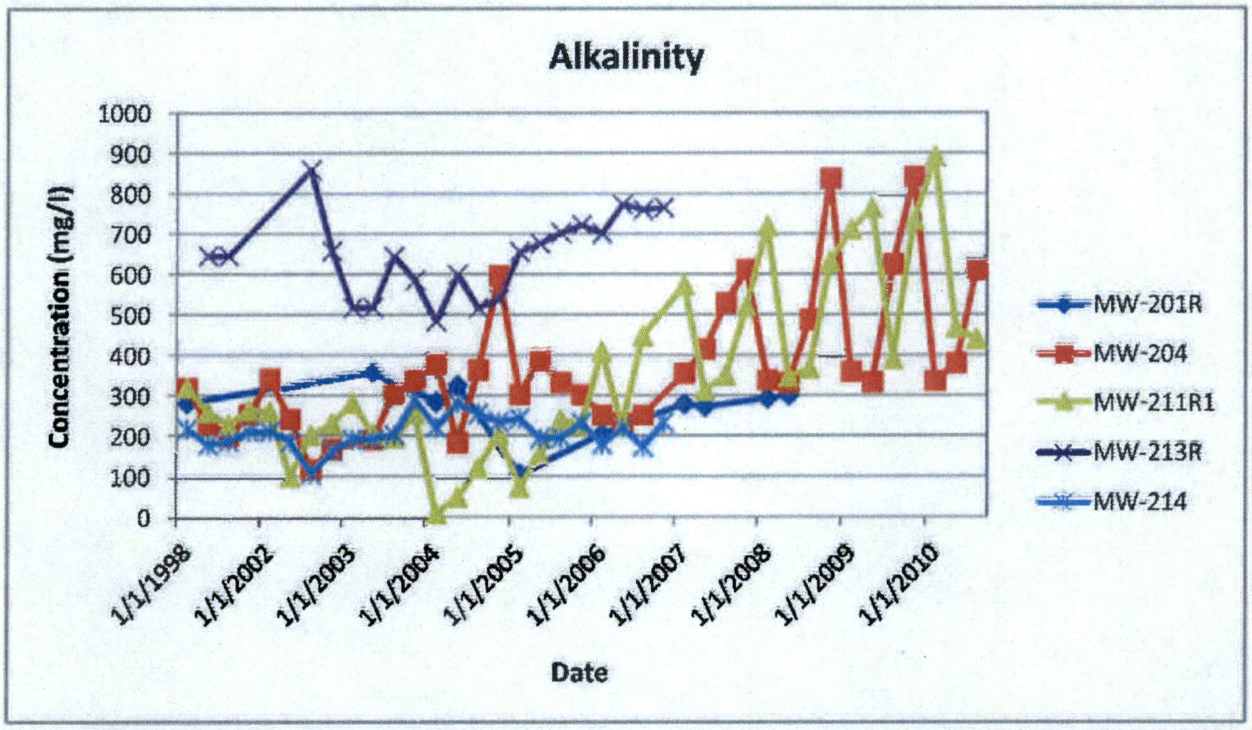
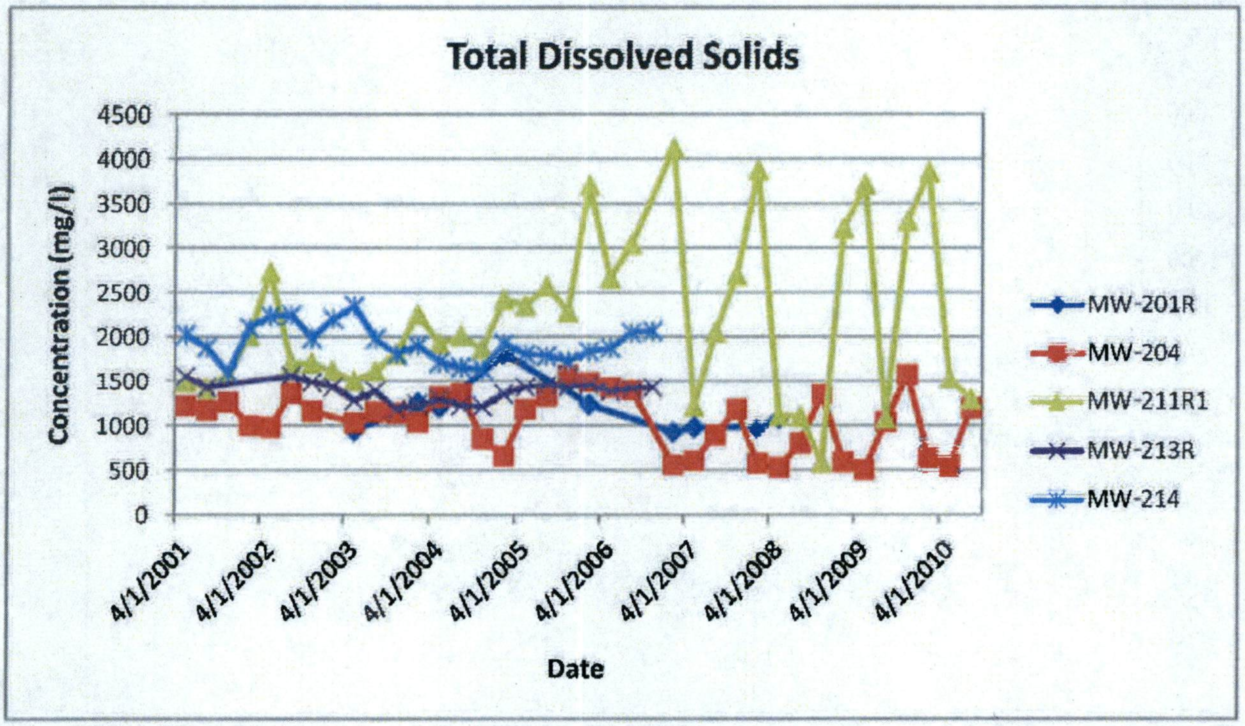


FIGURE 5

KELLY RUN SANITATION, INC
PITTSBURGH COAL
TIME SERIES PLOTS



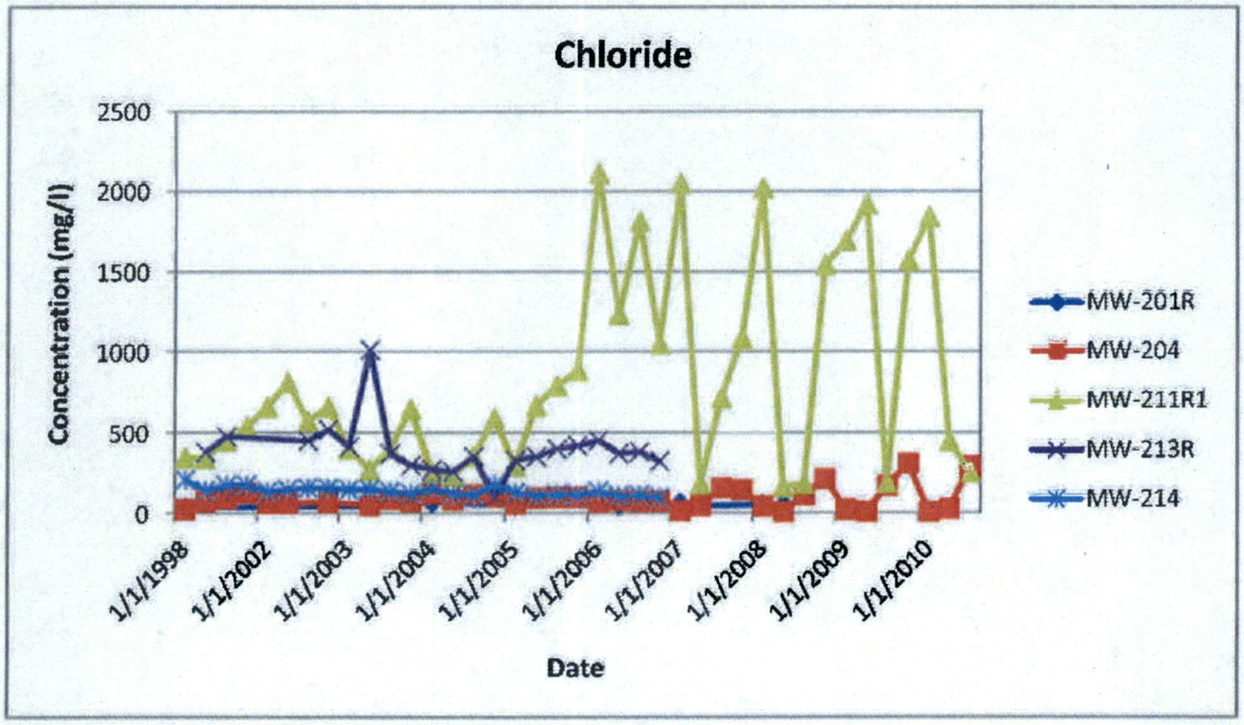


FIGURE 5

KELLY RUN SANITATION, INC
PITTSBURGH COAL
TIME SERIES PLOTS

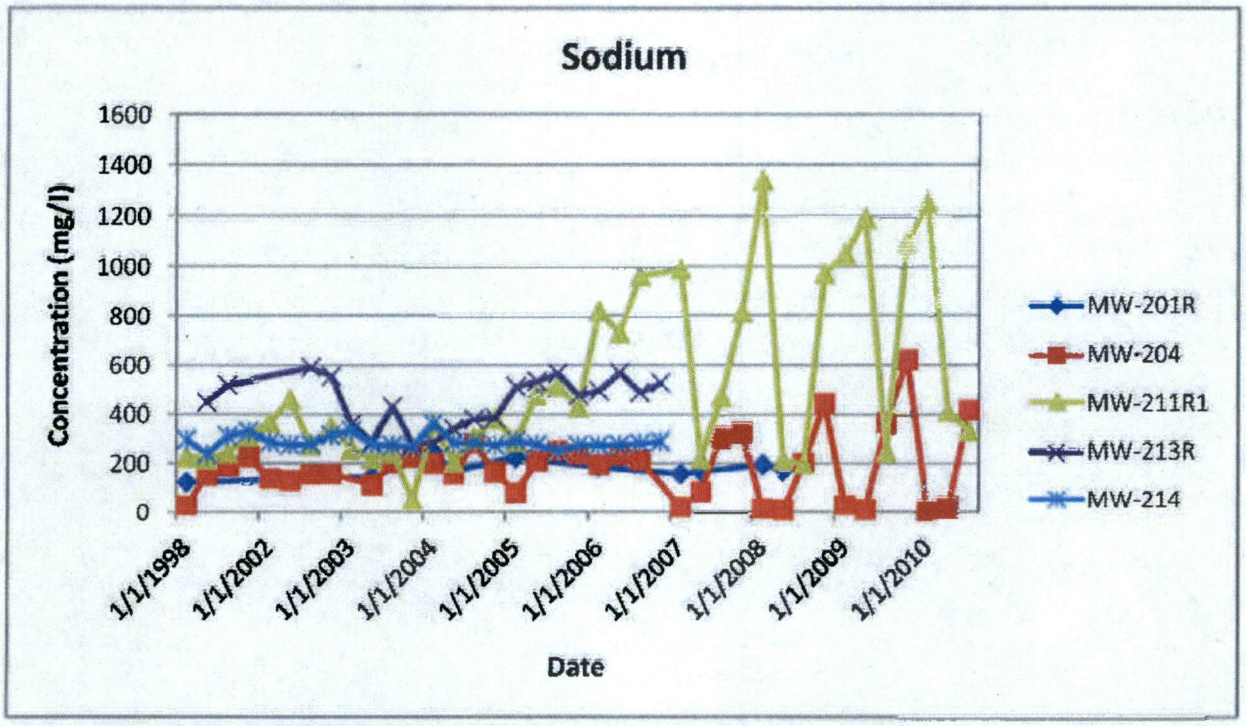
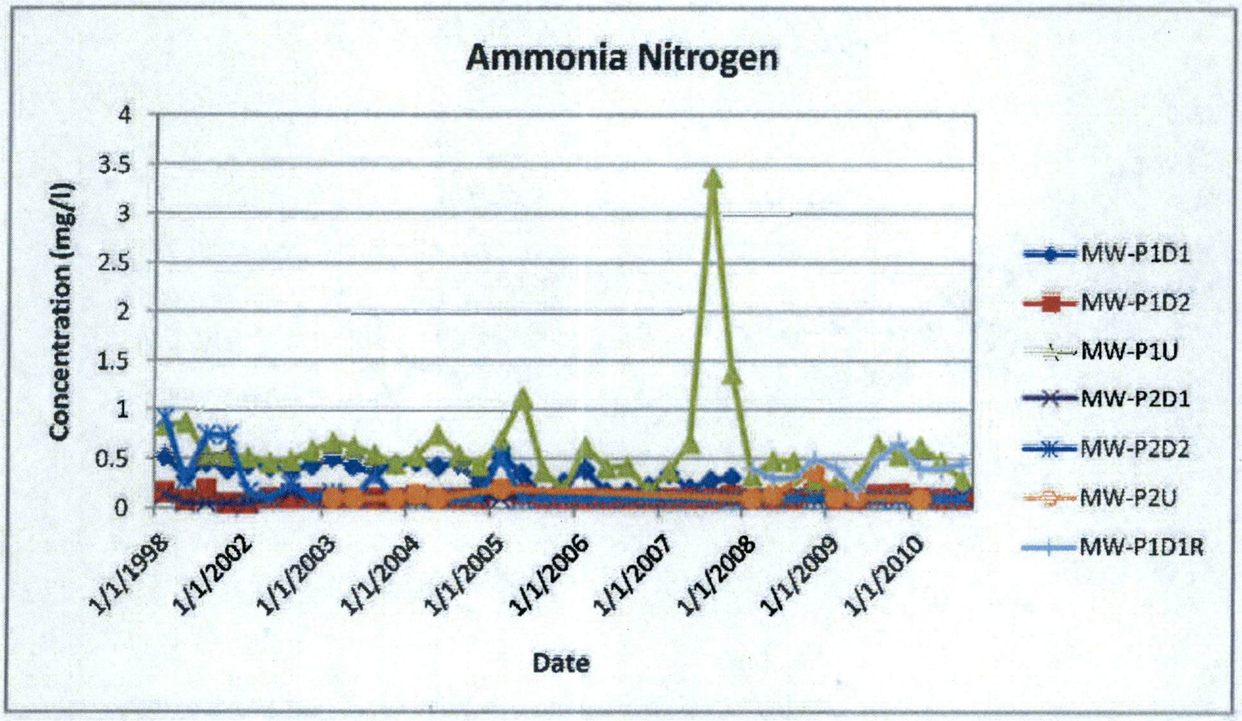


FIGURE 6

KELLY RUN SANITATION, INC
LEACHATE POND
TIME SERIES PLOTS



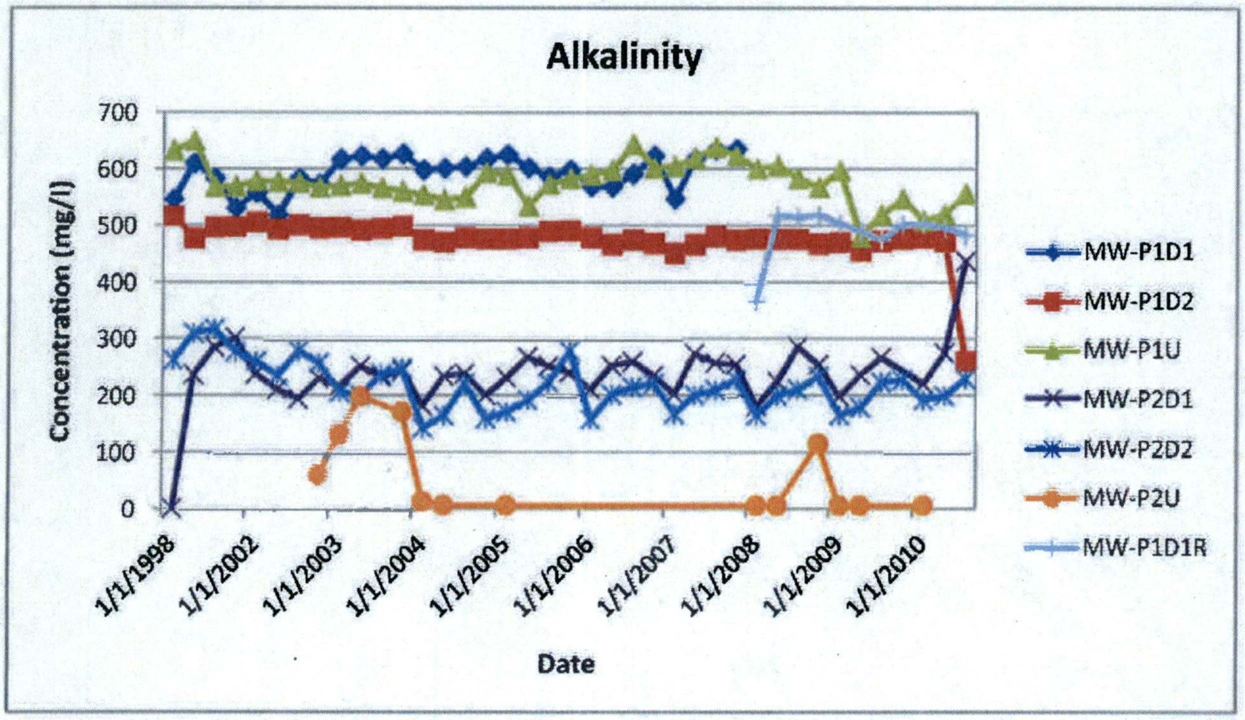
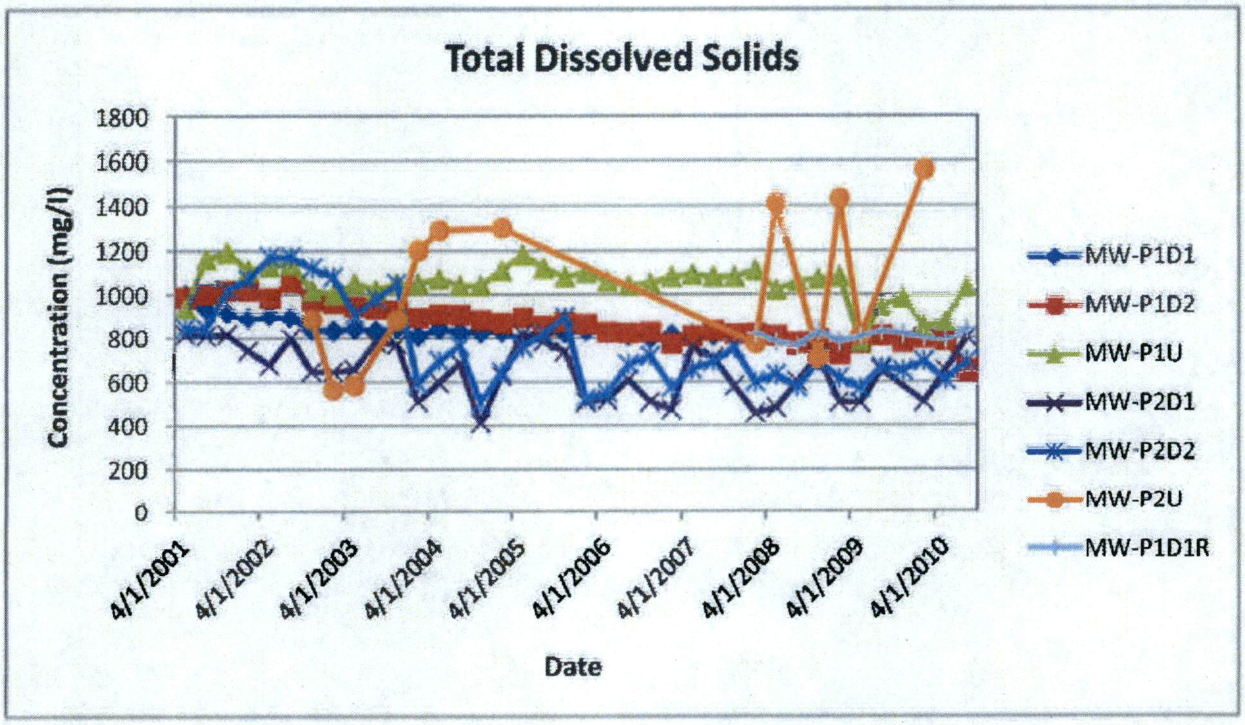


FIGURE 6

KELLY RUN SANITATION, INC
LEACHATE POND
TIME SERIES PLOTS



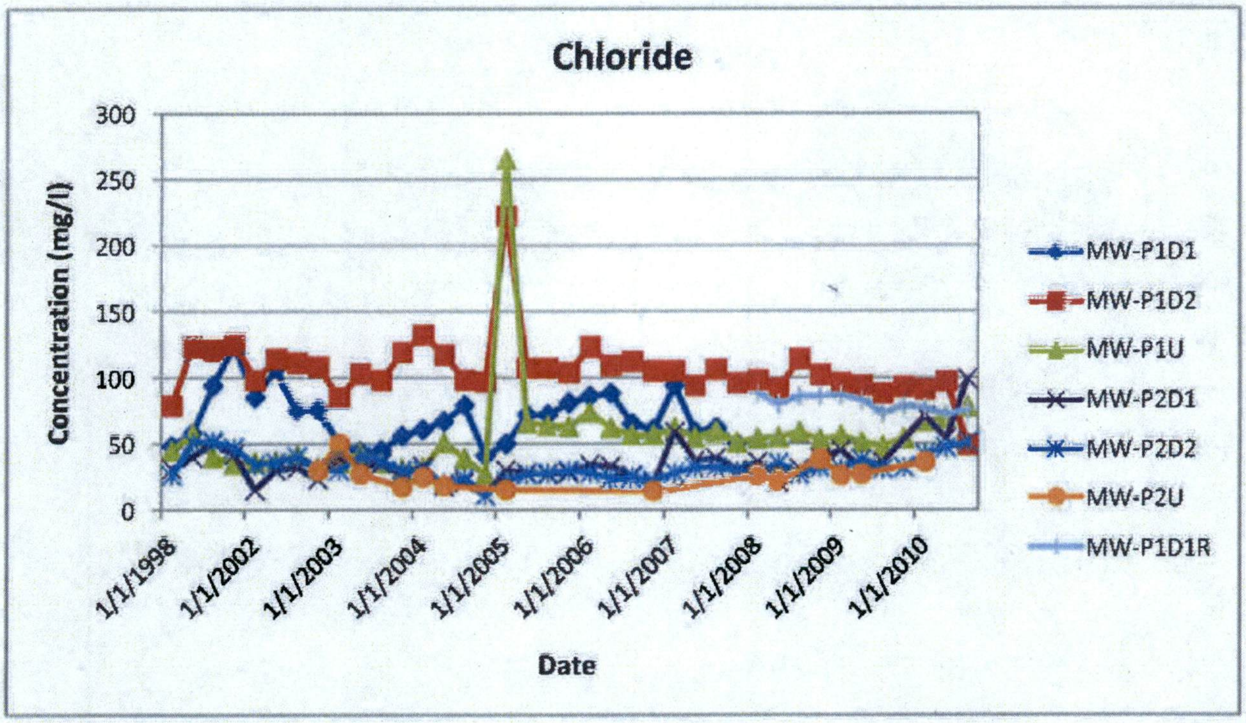
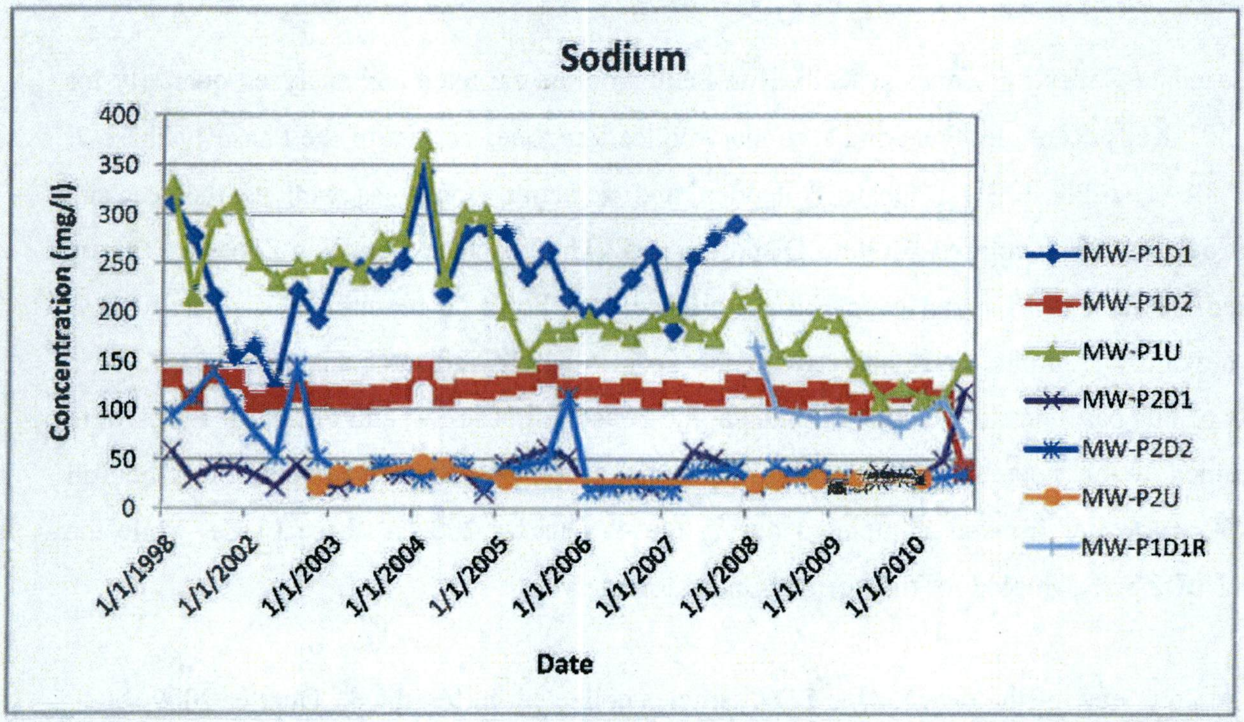


FIGURE 6

KELLY RUN SANITATION, INC
LEACHATE POND
TIME SERIES PLOTS



APPENDIX D

LEACHATE SAMPLING AND ANALYSIS

The Leachate Collection Zones at Kelly Run Sanitation are sampled and analyzed quarterly for Form 50. Kelly Run's leachate and secondary collection zones consist of the Phase 1, Phase 2, Phase 3A, and Phase 3B leachate collection and detection zones, as well as the leachate collection zone for the closed Western Disposal Area. The Leachate Detection Zones (LDZ) are sampled annually (4^{th} Quarter event) in accordance with Form 50 requirements. These LDZs were previously sampled and analyzed for the Form 50 LDZ indicator analytes. Based on a review of this baseline fluid composition data, the Phase 2, Phase 3A, and Phase 3B LDZs were determined to be potentially leachate influenced. Therefore, annual sampling for the full Form 50 parameter list was completed during the 4^{th} Quarter 2009 at these LDZs, while the Phase 1 LDZ was sampled for the Form 50 indicator analytes.

Based on a review of the data for the LDZ samples collected during the 4^{th} Quarter 2009, MCL exceedances were noted. Therefore, the Form 19 detection zone add-on list was included in the annual groundwater sampling program completed during the 1^{st} Quarter 2010.

APPENDIX E
METHANE PROBE MONITORING

1.0 INTRODUCTION

The following methane monitoring report is a summary and evaluation of the gas monitoring and control activities for the Kelly Run Sanitation, Inc. Landfill (KRS) located in Forward Township, Allegheny County, Pennsylvania for the quarterly period ending September 30, 2010. Results of the quarterly gas probe monitoring data collected on August 24 – September 30, 2010 are submitted herein as part of the KRS Quarterly Monitoring Report.

1.1 BACKGROUND

KRS Landfill currently maintains and utilizes a system of landfill gas monitoring probes to monitor for the presence of methane. The current system includes 133 probes located spatially around the landfill boundaries (13 probes were decommissioned prior to the 4th Quarter 2006 event in accordance with the August 14, 2006 WDA Permit). The landfill gas monitoring probes are generally constructed of a single perforated PVC well casing installed at a shallow depth, often referred to as the "A" zone. Nested probes (two or three probes at the same location) monitor for the presence of methane in the shallow ("A"), intermediate ("B"), and deep ("C") zones.

The majority of gas monitoring probes in both the Western and Municipal Disposal Areas are screened within the Benwood Limestone Aquifer. Some of the shallow probes monitor the Waynesburg and Uniontown Formations above the Benwood Limestone. Deeper probes monitor the Sewickley, Redstone, and Pittsburgh Sandstones.

1.2 REPORTING REQUIREMENTS

The monitoring of landfill gas (methane) concentrations is conducted on a quarterly basis following the requirements set forth in PA Code Title 25 Section 273.292, Gas Control and Monitoring and Pennsylvania Department of Environmental Protection (PADEP) Permit Conditions.

PA Code 273.292 provides the following criteria to determine the regulatory compliance of combustible gas levels at the landfill:

1. 25% of the lower explosive limit (LEL) at a structure within the landfill site.
2. The LEL at the boundaries of the landfill site.
3. 25% of the LEL in an adjacent area, including buildings or structures on adjacent areas.

The maximum acceptable combustible gas concentrations permitted under current regulatory and permit requirements is 5.0% methane in air. This concentration is equal to 100% of the LEL. Concentrations above the maximum acceptable limit of 5.0% are reported to PADEP and the Allegheny County Health Department (ACHD). In the event an exceedance of this limit occurs in a given monitoring probe, daily monitoring of the probe is initiated and continued until the methane level reaches acceptable limits. Persistent exceedances occasionally require additional gas extraction efforts in those areas.

1.3 LANDFILL GAS MONITORING PROCEDURES

Written protocols for conducting methane monitoring were established in accordance with Permit Condition No. 21 of the Solid Waste Landfill Permit Modification dated February 6, 1997 and the August 14, 2006 WDA Permit.

The Landfill Gas Monitoring Procedures for obtaining methane concentration readings from the monitoring probes were submitted to PADEP in a report dated April 7, 1997. Specifically, the

procedures address the need to maintain the proper instrument calibration, obtain and document all necessary readings, evaluate probe water levels, and the dewatering of probes were necessary. KRS conducted the landfill gas monitoring according to these approved procedures. In addition, any liquids removed during probe dewatering are disposed of into the leachate manhole consistent with the requirements of the March 13, 1996 Consent Decree.

2.0 LANDFILL GAS MONITORING

The landfill gas monitoring system consists of both single and nested design probes. All 133 gas monitoring probes were tested for the presence of methane. The following Gas Monitoring Probe Field Log presents a summary of the methane and LEL concentrations for each gas monitoring probe tested.

No methane was detected at the LEL level at any probe for this monitoring period.

3.0 CONCLUSIONS

The LEL concentration was not detected at any monitoring probe. Therefore, all methane gas monitoring probes in the KRS network continue to demonstrate compliance with the acceptable regulatory limit of 5.0%.

APPENDIX F
DUST FALL ANALYSIS

Dust collection analysis is performed monthly through the placement of dust fall jars around Kelly Run Sanitation Landfill. The jars are collected monthly and fresh jars are placed in the holders.

No samples exceeded the maximum dust fall of 1.5 mg/cm^2/month during the 3rd Quarter 2010 as specified in PA 25 §273.217 and cited in PA 25§131.3 except total suspended solids at DFC-6 during the month of July. The laboratory case narrative described the sample as containing brown water with dirt, seeds, and a lot of leaves.

WASTE MANAGEMENT

KELLY RUN SANITATION, INC. LANDFILL
FORWARD TOWNSHIP, ALLEGHENY COUNTY
PENNSYLVANIA
PADEP I.D. NO. 100663

QUARTERLY REPORTING REQUIREMENTS

SECOND QUARTER 2010

Submitted:
August 2010

Prepared by:
Civil & Environmental Consultants, Inc.
4000 Triangle Lane, Suite 200
Export, PA 15632-9255
CEC Project 050558

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1.0 INTRODUCTION

1.1 SCOPE AND PURPOSE

This report summarizes the results of the 2nd Quarter 2010 groundwater monitoring activities at Kelly Run Sanitation, Inc. Landfill (KRS). This work was conducted on May 17 – 18, 2010 to satisfy requirements of the Pennsylvania Department of Environmental Protection (PADEP). KRS operates a municipal waste landfill (Permit I.D. No. 100663) in Forward Township, Allegheny County.

KRS has been operating since 1965 and consists of five disposal units (Figures 1, 2, and 3):

- 17-acre pre-RCRA disposal area identified as the Old Waste Area (OWA) has been closed since early 1970s and was capped in 1997;
- A 9.0-acre Phase I Area closed municipal waste landfill, that was capped in 1996 (operating permit issued March 14, 1991);
- A 24.3-acre Phase II Area closed municipal waste landfill, that was capped in 1998 (operating permit issued January 18, 1995);
- A Phase III Area active municipal waste landfill (operating permit issued February 6, 1997); and
- The 35.0-acre Western Disposal Area (WDA), a closed and capped hazardous waste landfill (Hazardous Waste Postclosure Permit U.S. Environmental Protection Agency ID No. PAD004810222).

The Groundwater Monitoring Program at KRS incorporates permanent monitoring elements to provide environmental protection during and after landfill development. Field work, sampling methodologies, data evaluation, data QA/QC, and chemical analyses were conducted in accordance with the approved site permits.

1.2 SITE DESCRIPTION AND BACKGROUND

KRS currently receives municipal waste at a rate of about 8,000 tons per month. The facility consists of a 408-acre parcel, of which 48 acres are currently approved for active waste disposal. KRS is permitted to take municipal solid waste and other approved special wastes.

The WDA consists of approximately 35 acres and is a closed hazardous waste disposal landfill. The WDA was constructed with an engineered clay liner and leachate collection system (i.e., interceptor drain) and was capped with a very low density polyethylene (VLDPE) geomembrane in the early 1990s. The 17-acre OWA is a natural attenuation landfill that was capped in 1997. Phase I (9.0 acres) and Phase II (24.3 acres) landfill areas were constructed as lined landfills and were completely capped and closed in 1998. Both Phase I and Phase II have leachate detection zones. The Phase III area is a 48-acre permitted double-lined landfill with a leachate detection zone. The Phase III landfill is the only active waste placement area at the landfill and receives approximately 280 tons per day of solid waste.

2.0 GEOLOGY AND HYDROGEOLOGY

2.1 REGIONAL GEOLOGY

KRS is located within the Appalachian Physiographic Province (Heath, 1984). This province is characterized by relatively deeply incised valleys and low rolling hills. KRS is constructed within the head of a relatively deeply incised valley and upon the adjacent ridge to the south. The surficial bedrock geology of KRS consists of Paleozoic deposits of the Monongahela and Conemaugh Groups. No Quaternary sedimentary deposits exist at the site. The entire site area has been deep-mined for the Pittsburgh Coal.

2.2 LOCAL GEOLOGY

The Pennsylvanian-aged Monongahela Group is defined as the interval between the base of the Waynesburg Coal and the base of the Pittsburgh Coal. The Monongahela has an average thickness of 350 feet in this portion of southwestern Pennsylvania and consists of five units, from stratigraphically lowest to highest: Pittsburgh, Redstone, Sewickley, Uniontown, and Waynesburg. The Pittsburgh Formation consists of approximately 100 feet of coal, shale, limestone, and sandstone and is conformably overlain by the Redstone Formation. The Redstone is approximately 80 feet thick and includes the interval between the Redstone Limestone and the base of the Sewickley Coal. The Redstone Coal is approximately 2 to 4 feet thick and the Pittsburgh Coal seam is 8 to 9 feet thick.

2.2.1 Uniontown Formation

The Uniontown Formation, the uppermost unit exposed at KRS, consists of 50 to 90 feet of interbedded shale, claystone, limestone, and sandstone. Only 20 feet of the Upper Member of the Uniontown is exposed on the adjacent hilltops. The Lower Member of the Uniontown Formation rests conformably beneath the Upper Member. In this area, the Lower Member is approximately 30 to 35 feet thick. The basal unit of the Lower Member is the Uniontown Coal, which is usually represented by 12 to 18 inches of carbonaceous shale. The lithologic units above the Uniontown Coal are comprised of

interbedded sandstone and shale through the lower and middle parts of the member and interbedded calcareous shale and argillaceous limestones in the upper part. Both the Upper Member and the Lower Member are moderately to severely weathered in outcrops exposed by earth moving activities at the site.

2.2.2 Pittsburgh Formation

The Pittsburgh Formation is located stratigraphically between the Uniontown Coal at the top and the base of the Pittsburgh Coal. This formation has a thickness of about 255 feet at the site. The Pittsburgh Formation consists of five members, from stratigraphically highest to lowest: Upper Member, Sewickley Member, Fishpot Member, Redstone Member, and the Lower Member.

2.2.2.1 Upper Member - The Upper Member extends from the bottom of the Uniontown Coal to the top of the Benwood Limestone Bed in the Sewickley Member. The Upper Member is in the range of 80 to 90 feet thick at the site and is comprised of interbedded shale, claystone, and argillaceous limestone. Many of the shale and claystone beds are calcareous. There are four persistent limestone beds in the Upper Member that are identified from stratigraphically highest to lowest as Limestone D, Limestone C, Limestone B, and Limestone A (Dodge, 1985 and Johnson, 1929). These limestone beds were considered part of the Benwood Limestone in older geologic literature, but they have been divided into individual beds in the Upper Member in recent geologic information. The four limestone beds range in thickness from about 1-foot to as much as 10 feet thick, although where the limestone beds are thicker than about 2 feet, they commonly have thin interbedded shale or claystone partings several inches thick.

2.2.2.2 Sewickley Member - The Sewickley Member extends from the top of the Benwood Limestone at the top of the Sewickley Member to the base of the Sewickley Coal at the base of this member. In the Phase III landfill area and adjacent areas, the Sewickley Member is 50 to 60 feet thick. The Benwood, which is the dominant unit in this member, is comprised of interbedded argillaceous limestone, shale, claystone, and fine-grained sandstone beds. Individual limestone beds can be 5 to 6 feet thick, but are

typically about 2 feet thick. Calcareous shale, claystone, and fine-grained sandstone beds separate the limestone beds. The bottom 5 to 10 feet of the member is comprised of shale and includes the Sewickley Coal bed, which in this area is a carbonaceous shale bed up to 4 feet thick.

2.2.2.3 Fishpot Member - The Fishpot Member of the Monongahela Group occupies the interval from the bottom of the Sewickley Coal at the top to the top of a limestone bed, which is the uppermost bed in the underlying Redstone Member. The Fishpot Member has an average thickness of 20 feet at the site and is comprised of sandstone, limestone, and shale.

2.2.2.4 Redstone Member - The Redstone Member occupies the interval from the top of the limestone bed mentioned above to the bottom of the Redstone Coal. This member has a thickness in the range of 30 to 35 feet and is comprised of an argillaceous limestone bed in the upper 5 feet and is underlain by shale with some thin interbedded sandstone units. The Redstone Coal horizon, which is the basal unit of the member, varies in thickness from 2 to 4 feet thick within the area.

2.2.2.5 Lower Member - The Lower Member of the Monongahela Group occupies the interval from the bottom of the Redstone Coal at the top of the Member to the bottom of the Pittsburgh Coal at the base of the Member. The Lower Member is 70 to 80 feet thick and is comprised predominantly of shale and claystone. The Pittsburgh Coal, the basal unit in this Member, has been deep-mined under the entire site area. The coal has a thickness of 8 to 9 feet in the vicinity of the site. Mine maps for the underground mine workings indicate that the coal was mined by the complete retreat method after room-and-pillar mining (DEI, 1996a).

2.2.3 Conemaugh Group

Underlying the Monongahela Group is the Conemaugh Group. This group of rocks has a thickness of 550 to 600 feet in the western Pennsylvania area and is comprised of interbedded sandstone, shale, and claystone units with thin limestone beds and thin coal

beds that are not economically important resources. The Conemaugh Group lies below drainage in the area.

2.3 STRUCTURAL GEOLOGY

The Appalachian Physiographic Province is characterized by a series of low amplitude, symmetrical, and subparallel anticlines and synclines. Regionally, these fold axes trend roughly north/northeast-south/southwest. KRS is located on the east limb of the Roaring Run (Murrysville) Anticline and strata at the site generally strike N80° E and dip 2° SE.

2.4 SITE HYDROGEOLOGY

The monitoring well network targets the water-bearing zones where any potential impact would be observed at the earliest possible time. Two aquifers have been identified at KRS: the Benwood Limestone and the Pittsburgh Coal. Vertical gradients between the aquifers are generally downward (DEI, 1995).

2.4.1 Benwood Limestone Hydrostratigraphic Unit

Groundwater occurs under perched conditions within the Benwood Limestone (DEI, 1996a). Published reports indicate that the Benwood Limestone is a poor producer of groundwater in southern Allegheny County (Piper, 1933). Piper (1933) indicates that in this area the yields from the Benwood Limestone are small and erratic and a considerable proportion of wells completed into this unit are unsuccessful.

Groundwater flow direction is dictated by the gentle southeastward dip that occurs throughout the site area. The horizontal gradient is 0.0087 ft/ft (measured May 17 – 18, 2010; calculated from MW-302 to MW-311) (Figure 2). Discharge from the Benwood Limestone Hydrostratigraphic unit is primarily to springs in the site area and local surface water bodies. The unnamed tributary to Fallen Timber Run is the principal receiving stream downgradient of the site.

Groundwater within the Benwood occurs as a result of secondary porosity caused by joint and fracture planes occurring within the rock. Primary porosity occurring with the Benwood appears to be negligible (DEI, 1996a). Groundwater within the Benwood occurs at the base of this unit and downward vertical flow is restricted by the underlying carbonaceous shale of the Sewickley Coal horizon. Constant-rate pumping tests indicate that the measured hydraulic conductivity is approximately 1,14 x 10^{-3} cm/sec (3.23 ft/day) and calculated porosity is 10 percent (DEI, 1996a).

Wells drilled through the Benwood and completed in the Pittsburgh Coal are characterized by not having encountered groundwater. DEI (1996a and 1996b) noted that groundwater flow does not occur between the Benwood and the Pittsburgh Coal and the geochemical fingerprints for these individual hydrostratigraphic units are different.

Groundwater within the Benwood is classified as a calcium-magnesium bicarbonate type of water. However, groundwater sampled from wells located south (downgradient) of the WDA [reported from Benwood monitoring wells MW-302, MW-303 (redrilled as MW-303R), MW-305 (decommissioned), MW-306 (decommissioned), and MW-307] are dominant in sodium, chloride, or both sodium and chloride (DEI, 1996a).

2.4.2 Pittsburgh Coal Hydrostratigraphic Unit

The Pittsburgh Coal Hydrostratigraphic Unit consists of the remnant mine workings, voids, and stumps in the retreat-mined Pittsburgh Coal. Piper (1933) concluded from mining observations that the Pittsburgh Coal in this area is not generally a water-bearing unit. Groundwater quality in the Pittsburgh Coal is generally degraded due to the presence of elevated levels of metals and sulfate. DEI (1996b) reported that groundwater within the Pittsburgh Coal is, in general, a non-dominant cation sulfate type of water.

Groundwater in the Pittsburgh Coal occurs under unconfined conditions (DEI, 1996b). A mine pool probably exists downgradient of the landfill. Groundwater recovered from the generally dry Pittsburgh Coal groundwater monitoring wells shows an acid-mine drainage characteristic (i.e., elevated concentrations of sulfate, iron, magnesium,

aluminum). Further, springs issuing from the Pittsburgh Coal 1 to 2 miles downgradient of the landfill show no influence related to leachate indicator parameters, but do show elevated acid-mine drainage constituents (DEI, 1996b). Consequently, DEI (1996b) concluded that the Benwood aquifer is not draining to the Pittsburgh Coal.

The Pittsburgh Coal unit occurs approximately 210 feet below the base of the active landfill (double-lined Phase III area). The Pittsburgh Coal has a measured hydraulic conductivity of 7.42 x 10^{-4} cm/sec (2.103 ft/day) (DEI, 1996b). Groundwater flow in this unit is structurally controlled and generally follows dip slope to the south-southeast (Figure 3). The Pittsburgh Coal has a measured horizontal hydraulic gradient (measured May 4 – 6, 2009; calculated from MW-201R to MW-211R1) to the south of 0.009 ft/ft. The effective porosity of the Pittsburgh Coal is estimated at 10 percent (DEI, 1996b).

3.0 FIELD PROGRAM, MONITORING RESULTS, AND DISCUSSION

3.1 VISUAL INSPECTION PROGRAM

The visual inspection program was implemented at KRS to aid in the early detection of a potential release. The visual inspection program performed by the sampling team includes physical examination of any stresses in biological communities, unexplained changes in soil characteristics, visible signs of leachate migration (i.e., leachate seeps), potential water table mounding beneath the waste management unit, and any other change to the environment due to the waste management unit.

3.2 WELL NETWORK AND GROUNDWATER ELEVATION MEASUREMENTS

3.2.1 Well Network

Based on the August 14, 2006 revision to the WDA post-closure care permit, the groundwater detection monitoring program for the WDA and municipal waste landfills at KRS consists of 21 groundwater monitoring wells that monitor 2 groundwater units. Each monitoring well network targets the preferential flowpath for the facility.

Detection Monitor Well Network

Monitored Zone	Upgradient Wells	Downgradient Wells
Benwood Limestone (Leachate Pond 3/4)	MW-301R	MW-302, MW-303R, MW-304, MW-307D, MW-310D, MW-310R, MW-311, MW-312R, MWPZ-1, MWPZ-2, MWPZ-3
Pittsburgh Coal	MW-201R	MW-204, MW-211R1
Lower Leachate Pond (Pittsburgh Coal)	MW-P1U	MW-P1D1R, MW-P1D2
Upper Leachate Pond (Pittsburgh Coal)	MW-P2U	MW-P2D1, MW-P2D2

3.2.2 Groundwater Elevation Measurements

Prior to initiation of groundwater purging and sampling activities, depth to water and water level elevation (feet above mean sea level) were recorded to the nearest hundredth of a foot. Water levels were collected from a total of 19 monitoring wells (MW-303R is a groundwater recovery well, and MW-P2U reference elevation is not available). The water level measurements are utilized in preparation of groundwater contour maps to determine groundwater flow direction and gradient at the site.

Water level data were collected from May 17 – 18, 2010 using an electronic water level meter. Depth to groundwater was measured in each well and converted to elevations in feet above mean sea level (Table 2). Groundwater elevations for the 2nd Quarter 2010 sampling event are generally comparable to historical groundwater elevation measurements.

Using water levels measured on May 17 – 18, 2010, potentiometric surface maps were prepared that depict a plan view of horizontal groundwater flow (Figures 2 and 3). Groundwater within the Benwood Hydrostratigraphic Unit generally flows to the south and southeast (Figure 2). Groundwater within the Pittsburgh Coal Hydrostratigraphic Unit generally flows to the south-southeast (Figure 3).

3.3 GROUNDWATER GRADIENT AND FLOW VELOCITY

The horizontal groundwater seepage velocity downgradient of the landfill was estimated using the following equation:

$$v = \frac{(K_h i)}{n_e}$$

Where:

v	= average groundwater velocity;
K_h	= aquifer horizontal conductivity;
i	= average hydraulic gradient; and
n_e	= effective aquifer porosity (Freeze and Cherry, 1979).

The potentiometric surface map (May 17 – 18, 2010) of the Benwood Hydrostratigraphic Unit indicates that groundwater flow in this unit is from northwest to southeast with a horizontal gradient of 8.7×10^{-3} ft/ft (Figure 2). The average horizontal velocity of the Benwood Hydrostratigraphic Unit is 2.81×10^{-1} ft/day (102.6 ft/year), based upon an average hydraulic conductivity of 1.14×10^{-3} cm/sec (3.23 ft/day) (DEI, 1996a) and effective porosity of 10 percent (DEI, 1996a).

The potentiometric surface map (May 4 – 6, 2009) of the Pittsburgh Coal Hydrostratigraphic Unit indicates that groundwater flow in this unit is from north-northwest to south-southeast with a horizontal gradient of 9.0×10^{-3} ft/ft (Figure 3). The average horizontal groundwater velocity of the Pittsburgh Coal Hydrostratigraphic Unit is 1.89×10^{-1} ft/day (69 ft/year), based upon an average hydraulic conductivity of 7.42×10^{-4} cm/sec (2.103 ft/day) (DEI, 1996b) and effective porosity of 10 percent (DEI, 1996b). Of note, 2nd Quarter 2009 water level measurements were used for groundwater velocity calculations in the Pittsburgh Coal Hydrostratigraphic Unit since MW-201R has remained dry since the 3rd Quarter 2009.

3.4 SAMPLING AND ANALYTICAL PROGRAM

3.4.1 Field Program

Field sampling activities for the groundwater monitoring wells for the 2nd Quarter 2010 were conducted May 17 – 18, 2010 (Tables 1 and 2). Monitoring well purging and sampling activities were implemented in accordance with the site's Groundwater Sampling and Analysis Plan and site permit. Wells were purged and sampled using dedicated pump systems or hand bailers (Appendix C).

3.4.2 Laboratory Analysis and Monitoring Parameters

As described in the municipal site's Groundwater Sampling and Analysis Plan (CE Consultants, 1995) and the WDA's Groundwater Monitoring and Reporting Plan (MFG, Inc., 2003), the KRS Landfill monitoring list was selected based on an evaluation of site-specific information including background groundwater chemistry, leachate analytical results, and chemical detectability, mobility, and persistence. Monitoring wells

at the site are analyzed for PADEP Form 19 constituents and additional parameters at select wells in accordance with the recently revised (August 14, 2006) post-closure permit for the WDA.

DETECTION MONITORING
PADEP FORM 19 QUARTERLY CONSTITUENTS

INORGANIC AND GENERAL CHEMISTRY

Alkalinity, total*	Iron	Sodium*
Ammonia-nitrogen*	Magnesium*	Sulfate*
Bicarbonate (as $CaCO_3$)*	Manganese*	Total Organic Carbon*
Calcium*	Nitrate-Nitrogen	Total Dissolved Solids*
Chemical Oxygen Demand*	pH, Field & Laboratory*	Total Phenolics
Chloride*	Potassium*	Turbidity
Fluoride	Specific conductance,	
	Field & Laboratory*	* Indicator analyte

ORGANIC CHEMISTRY

Benzene	*cis*-1,2-Dichloroethene	Toluene
1,2-Dibromoethane	*trans*-1,2-Dichloroethene	1,1,1-Trichloroethane
1,1-Dichloroethane	Ethyl benzene	Trichloroethene
1,1-Dichloroethene	Methyl chloride	Vinyl chloride
1,2-Dichloroethane	Tetrachloroethene	Xylene

ADDITIONAL CONSTITUENTS FOR:
MW-201, MW-204, MW-211R1, MW-P2U, MW-301R, MW-302R,
MW-303R, MW-304, MW-307, MW-310R, MW-311D, AND MW-312R

QUARTERLY PARAMETERS	ANNUAL PARAMETERS
Total Organic Halogen	Lead
Chromium	Arsenic
Naphthalene	Aluminum
Creosote	Cyanide

ADDITIONAL CONSTITUENTS FOR:
MW-PZ-1, MW-PZ-2, AND MW-PZ-3

QUARTERLY PARAMETER	SEMI-ANNUAL PARAMETER
Total Organic Halogen	Naphthalene

All water samples collected at the site were delivered to Geochemical Testing, Inc. in Somerset, PA for chemical analysis. Geochemical Testing is certified in the Commonwealth of Pennsylvania for performing chemical analysis of the reported parameters. Original laboratory reports detail specific reporting limits (Appendices A, B, and C).

3.5 ANALYTICAL PROGRAM RESULTS

The 2nd Quarter 2010 sampling event was performed may 17 – 18, 2010. Twelve wells were sampled for Form 19 parameters. Twelve wells were sampled for WDA Post-Closure parameters. Additional constituents were analyzed for several Benwood Limestone and Pittsburgh Coal monitoring wells. One field duplicate, one field blank, and two trip blanks were also collected.

3.6 GEOCHEMICAL ANALYSIS

KRS submits a quarterly report that discusses groundwater quality from all of the monitoring wells specified in the PADEP approved permit. The permit requires quarterly sampling for Form 19 parameters and time-series evaluation of leachate indicator parameters. The time versus concentration plots were analyzed for significant trends of a given constituent, unexpected geochemical signatures, and anomalously high results.

3.6.1 Volatile Organic Compounds

The Benwood Limestone Hydrostratigraphic Unit has been shown to contain BTEX and naphthalene through several assessment reports (DEI, 1996a) and remediation of the aquifer was also addressed in a 1996 Consent Order and the August 14, 2006 WDA Permit. Further, Benwood Limestone groundwater monitoring well MW-303R is a recovery well that has operated as part of the remediation of the groundwater since 1996.

Several volatile organic compounds have historically been detected in Benwood Limestone groundwater monitoring wells. For the 2nd Quarter 2010 sampling event, benzene was detected in MW-302R (10.9µg/L) and MW-303R (112 µg/L), and ethylbenzene was detected in MW-303R (11.1 µg/L). With the exception of benzene at MW-303R, concentrations for each of the detections are within historical levels for each monitoring point. The concentration of benzene at MW-303R (112 µg/L) exceeded the previous historical high of 71.5 µg/L for this well. However, MW-303R is a recovery well that has operated since 1996 as part of the remediation of the Benwood Limestone aquifer. Volatile organic compounds were not detected above established reporting limits in any other wells.

3.6.2 Time-Series Analysis

The time versus concentration plots of five leachate indicator parameters (ammonia nitrogen, alkalinity, total dissolved solids, chloride, and sodium) were analyzed for significant trends, unexpected geochemical signatures, and anomalously high results.

3.6.2.1 Benwood - As shown on the time-series chart (Figure 4), no significant upward trend in the concentration of any indicator parameter was noted for the Benwood Hydrostratigraphic Unit. Geochemical analyses show that groundwater from the Benwood is a calcium bicarbonate (MW-304) to a sodium chloride (MW-311 and MW-312) dominant water type which is roughly consistent with that observed from previous studies (e.g., DEI, 1996a) (1st Quarter 2010: Figures 7 and 8).

3.6.2.2 Pittsburgh Coal - As shown on the time-series chart (Figure 5), no significant upward trend in the concentration of any indicator parameter was noted for the Pittsburgh Coal Hydrostratigraphic Unit except ammonia nitrogen, alkalinity, and sodium at MW-211R1, and alkalinity and sodium at MW-204. However, concentrations for alkalinity and sodium at MW-204, and all five leachate indicator parameters at MW-211R1 appear to fluctuate seasonally. In addition, since the concentrations of sodium, chloride, and total dissolved solids are higher at MW-211R1 than that of leachate, trends observed at this monitoring well do not appear to be the result of a leachate influence. Groundwater from the Pittsburgh Coal can generally be characterized as a calcium bicarbonate (MW-204) to sodium chloride (MW-211R1) water type

(1st Quarter 2010: Figures 9 and 10). Monitoring point MW-201R was dry during the 2nd Quarter 2010 sampling event.

3.6.2.3 Leachate Pond Wells - No significant upward trend in the concentration of any indicator parameter was noted for the Pittsburgh Coal Hydrostratigraphic Unit in the lower and upper leachate pond areas except a slight increasing trend for total dissolved solids at MW-P2U (Figure 6). However, groundwater chemistry at MW-P2U differs from leachate, and groundwater from this portion of the Pittsburgh Coal characterizes, in general, as a calcium-bicarbonate to calcium-sulfate type of water (2nd Quarter 2010: Figures 11 and 12).

3.6.2.4 Lysimeters - Two lysimeter sets (ML-1A and ML-2A) are located beneath the first two stages of the Phase III Area and are monitored for the presence of water. No water was detected in these lysimeters for the 2nd Quarter 2010 sampling event indicating that the liner system is not leaking into the subsurface (Table 1).

3.6.3 Surface Water Analysis

Six surface water samples (KR-2, FTR-2, ST-2, ST-3, ST-5, and SP-3) were collected March 10, 2010 for Form 19 analysis (SP-4 was dry) in accordance with the revised Groundwater Monitoring and Reporting Plan approved with the August 14, 2006 WDA Permit. The SP-series surface water points monitor the Benwood which crops out along the southern portion of the landfill. Surface water points ST-2 and FTR-2 monitor Fallen Timber Run. Surface water point KR-2 monitors an unnamed tributary to Fallen Timber Run. Surface point ST-3 monitors an unnamed tributary upstream of ST-2, and ST-5 is upgradient of ST-3 on the unnamed tributary to Fallen Timber Run.

Analyses were generally consistent with the historical data for these monitoring points. Volatile organic compounds were not detected in any surface water samples for the 2nd Quarter 2010.

4.0 LABORATORY AND FIELD QUALITY ASSURANCE AND QUALITY CONTROL

4.1 TRIP, FIELD, AND EQUIPMENT BLANKS

Two trip blanks, one field blank, and one duplicate sample were collected as part of the field sampling and analysis quality control/quality assurance activities. The field blank and trip blanks did not detect any constituents that would place the sampling event into question.

4.2 HOLDING TIMES

All samples submitted to Geochemical Testing were analyzed within the required holding times as determined by the analytical method.

4.3 SAMPLE SURROGATE RECOVERIES

Sample recovery analyses are performed with each quarterly event and reported annually with the first quarter event. However, if results are not within acceptable ranges, notification would be included in the Quality Assurance Project Report prepared by Geochemical Testing (Appendix C).

4.4 METHOD BLANKS

No laboratory method blanks contained detectable concentrations of any constituents that would place the laboratory analyses into question (Appendix C).

4.5 LABORATORY CONTROL SPIKES

Laboratory control spikes for all analytical methods are performed with each quarterly event and reported annually with the first quarter event. However, if results are not within advisory limits, notification would be included in the Quality Assurance Project Report prepared by Geochemical Testing (Appendix C).

4.6 INITIAL CALIBRATION, CONTINUING CALIBRATION, AND INTERNAL MACHINE STANDARDS

Laboratory calibration is performed with each quarterly event and reported annually with the first quarter event. However, if results are not within acceptable limits, notification would be included in the Quality Assurance Project Report prepared by Geochemical Testing (Appendix C).

4.7 DUPLICATE SAMPLES

Duplicate sample analysis results were generally consistent with the corresponding original sample results.

5.0 CONCLUSIONS

Samples were collected at KRS according to appropriate sampling procedures for Form 19 and Form 50 parameters and sent to Geochemical Testing in Somerset, PA. The following observations are noted for the 2nd Quarter 2010 sampling event:

- The active and closed areas of KRS are underlain by two monitored hydrostratigraphic units: Benwood Limestone and the Pittsburgh Coal.
- KRS was sampled for Form 19 groundwater and surface water constituents on May 17 – 18, 2010.
- Several Benwood groundwater monitoring points were sampled for additional parameters in accordance with the August 14, 2006 WDA Permit.
- KRS leachate was sampled for Form 50 constituents on May 17, 2010.
- The Benwood Limestone Hydrostratigraphic Unit has a horizontal gradient to the south of 8.7×10^{-3} ft/ft, with a velocity of 0.281 ft/day (102.6 ft/year) (Figure 2).
- The Pittsburgh Coal Hydrostratigraphic Unit has a horizontal gradient to the south of 9.0×10^{-3} ft/ft, with a velocity of 0.189 ft/day (69 ft/year) (Figure 3).
- Volatile organic compounds were detected in Benwood Limestone groundwater monitoring wells MW-302R and MW-303R. Volatile organic compounds were not detected above established reporting limits in other surface water or in other groundwater monitoring wells.
- Time-series analyses indicate that there are no increasing trends in the leachate indicator parameters in groundwater at Kelly Run Landfill except for alkalinity and sodium at MW-204; ammonia nitrogen, alkalinity, and sodium at MW-211R1; and a slight increasing trend for total dissolved solids at MW-P2U. However, these rises do not appear to be the result of a leachate influence.

Based on a review of recent and historical data collected during routine monitoring events at KRS, the following observations are made:

- Groundwater elevation contour maps show that local groundwater gradient and velocity have been temporally consistent in both monitored groundwater units.
- Concentrations of trace metals and other inorganic constituents in groundwater samples were generally consistent with historical concentrations.
- Surface water analyses of metals and inorganic parameter concentrations are generally consistent with historical concentrations (Appendix B). The Benwood Spring continues to be collected and treated as leachate due to historical detections of volatile organic compounds.
- The Benwood Limestone Hydrostratigraphic Unit has been shown to historically contain BTEX and naphthalene through several assessment reports (DEI, 1996a) and remediation of the aquifer was also addressed in a 1996 Consent Order and the August 14, 2006 WDA Permit. Benwood groundwater monitoring well MW-303R is a recovery well that has operated as part of Kelly Run's groundwater remediation efforts since 1996.

Therefore, the major conclusions of this report are:

1. Continued landfilling activities do not appear to be altering the existing groundwater conditions.
2. The groundwater monitoring network is capable of monitoring the Benwood and Pittsburgh Coal Hydrostratigraphic units.
3. The frequency of sampling and the constituents analyzed are appropriate for determining if a release has occurred.

6.0 REFERENCES

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TABLE 1

KELLY RUN LANDFILL
PADEP I.D. NO. 100663

SECOND QUARTER 2010
FIELD PARAMETERS

AQUIFER	MONITORING POINT	SAMPLE DATE	SAMPLE TIME	WATER LEVEL[1] (ft)	WELL DEPTH[1] (ft)	WATER VOLUME[2] (gallons)	THREE VOLUMES (gallons)	WATER PURGED (gallons)	VOLUMES PURGED	FIELD PARAMETERS pH	COND (µS/m)	TEMP (C)	COMMENTS
Benwood Limestone	MW-301R	05/17/2010	02:10 PM	129.00	135.85	4.45	13.36	1.30	0.29	6.71	1502	12.0	
	MW-302R	05/18/2010	10:50 AM	148.80	170.26	13.95	41.85	3.50	0.25	5.88	8863	15.8	
	MW-303R	05/17/2010	05:00 PM	44.10	63.20	12.42	37.25	4.00	0.32	5.88	1297	12.2	
	MW-304	05/18/2010	03:30 PM	48.80	64.15	9.98	29.93	2.00	0.20	6.42	1275	14.0	
	MW-307D	05/18/2010	12:25 PM	156.40	168.20	7.67	23.01	2.00	0.26	6.57	3536	13.9	
	MW-310D	05/18/2010	01:20 PM	126.15	128.84	1.75	5.25	1.50	0.86	12.40	8873	15.0	
	MW-310R	05/18/2010	DRY	105.30	108.81	2.28	6.84						Purged dry, insufficient water to sample
	MW-311	05/17/2010	01:00 PM	103.30	116.85	8.81	26.42	1.00	0.11	7.46	7872	11.9	
	MW-312R	05/17/2010	01:40 PM	169.80	182.65	8.35	25.06	5.00	0.60	6.51	6364	12.1	
	PZ-1	05/18/2010	10:00 AM	99.60	119.32	12.82	38.45	1.50	0.12	7.23	2743	13.3	
	PZ-2	05/17/2010	04:20 PM	113.20	129.45	10.56	31.69	4.00	0.38	7.40	2760	13.1	
	PZ-3	05/18/2010	10:20 AM	97.30	111.08	8.96	26.87	2.00	0.22	6.43	2740	13.5	
Pittsburgh Coal	MW-201R	05/17/2010	DRY	DRY	276.44								Insufficient Water to Sample
	MW-204	05/18/2010	11:50 AM	294.70	310.00	9.95	29.84	4.00	0.40	6.43	1068	14.0	
	MW-211R1	05/18/2010	02:45 PM	193.20	196.92	2.42	7.25	4.50	1.86	6.08	2681	15.0	
Lower Leachate Pond	MW-P1U	05/17/2010	03:10 PM	19.70	36.75	11.08	33.25	13.00	1.17	6.57	1372	13.2	
	MW-P1D1	05/17/2010	03:30 PM	29.00	38.82	6.38	19.15	3.00	0.47	6.82	1294	12.5	
	MW-P1D2	05/17/2010	02:50 PM	25.40	42.12	10.87	32.60	3.00	0.28	6.42	1221	12.4	
Upper Leachate Pond	MW-P2U	05/17/2010	DRY	91.15	92.34	0.77	2.32	1.00	1.29				Purged dry, insufficient water to sample
	MW-P2D1	05/17/2010	10:20 AM	92.60	96.50	2.54	7.61	1.00	0.39	6.53	9916	11.2	
	MW-P2D2	05/17/2010	11:50 AM	93.75	98.61	3.16	9.48	3.00	0.95	6.57	888	10.9	
Surface Water	KR-2	05/17/2010	03:20 PM							7.99	757	14.1	
	FTR-2	05/17/2010	04:10 PM							7.97	745	13.6	
	ST-2	05/17/2010	04:00 PM							8.05	539	13.7	
	ST-3	05/17/2010	03:45 PM							8.01	897	13.7	
	ST-5	05/17/2010	03:30 PM							8.24	835	14.5	
	SP-3	05/17/2010	12:50 PM							6.75	1211	12.9	
	SP-4	05/17/2010	DRY										Dry
Leachate	PHASE 1 DZ												Sampled Annually
	PHASE 2 DZ												Sampled Annually
	PHASE 3A DZ												Sampled Annually
	PHASE 3B DZ												Sampled Annually
	PHASE 1	05/17/2010	02:45 PM							7.76	5991	16.4	
	PHASE 2	05/17/2010	02:30 PM							6.80	4215	16.7	
	PHASE 3	05/17/2010	10:50 AM							6.35	7075	15.5	
	WDA LEACH.	05/17/2010	02:15 PM							5.84	1364	17.4	
Phase III Subgrade Monitoring Pt.	ML-1A	05/18/2010	DRY										Lysimeter is Dry
	ML-2A	05/18/2010	DRY										Lysimeter is Dry

Notes:
[1] Measured from top of inner casing.
[2] Calculated from 0.65 gallons per foot of water
Sampled by Cody Salmon, Aquascape
ft = feet

C = Degrees Centigrade
µS/m = microSiemens/meter
gpm = gallons per minute
N/A = Not Applicable
NP = Not Provided

TABLE 2

KELLY RUN LANDFILL
PADEP I.D. NO. 100663

SECOND QUARTER 2010
WATER-LEVEL ELEVATIONS

AQUIFER	MONITORING POINT	GRADIENT POSITION	MEASUREMENT DATE	MEASUREMENT POINT ELEV.[1] (ft amsl)	WATER LEVEL[2] (ft)	WATER LEVEL ELEV. (ft amsl)
Benwood Limestone	MW-301R	U	05/17/2010	1169.67	129.00	1040.67
	MW-302R	D	05/18/2010	1154.41	148.80	1005.61
	MW-303R[3]	D	05/17/2010	1653.57	44.10	1609.47
	MW-304	D	05/18/2010	1055.14	48.80	1006.34
	MW-307D	D	05/18/2010	1165.07	156.40	1008.67
	MW-310D	D	05/18/2010	1099.42	126.15	973.27
	MW-310R	D	05/17/2010	1099.39	105.30	994.09
	MW-311	D	05/17/2010	1100.37	103.30	997.07
	MW-312R	D	05/17/2010	1171.46	169.80	1001.66
	PZ-1	D	05/18/2010	1119.32	99.60	1019.72
	PZ-2	D	05/17/2010	1135.94	113.20	1022.74
	PZ-3	D	05/18/2010	1124.39	97.30	1027.09
Pittsburgh Coal	MW-201R	U	05/17/2010	1158.13	DRY	DRY
	MW-204	D	05/18/2010	1163.25	294.70	868.55
	MW-211R1	D	05/18/2010	1064.00	193.20	870.80
Lower	MW-P1U	U	05/17/2010	892.73	19.70	873.03
Leachate	MW-P1D1	D	05/17/2010	891.18	29.00	862.18
Pond	MW-P1D2	D	05/17/2010	888.43	25.40	863.03
Upper	MW-P2U	U	05/17/2010	NA	91.15	NA
Leachate	MW-P2D1	D	05/17/2010	963.17	92.60	870.57
Pond	MW-P2D2	D	05/17/2010	963.17	93.75	869.42

Notes:

[1] Elevation for the top of the PVC from well logs.
[2] Measured from the top of the 4" PVC riser pipe. Measured by Cody Salmon, Aquascape
[3] Groundwater Recovery Well

ft = foot
ft amsl = feet above mean sea level.
NA = Not Available
NM = Not Measured

TABLE 3

KELLY RUN SANITATION LANDFILL
PA DEP I.D. NO. 100663

SECOND QUARTER 2010
RESULTS OF CHEMICAL ANALYSES PERFORMED ON GROUNDWATER AND SURFACE WATER

				GROUNDWATER										
Chemical Constituent	Unit	Analytical Method No.	MCL	MW-201R	MW-204	MW-211R1	MW-301R	MW-302R	MW-303R	MW-304	MW-307	MW-310	MW-310R	MW-311
Inorganics														
Ammonia Nitrogen	mg/L as N	EPA 350.1&D	NA	DRY	0.7	4.76	0.415			0.43		19.9	DRY	1.44
Bicarbonate	mg/L as CaCO3	SM 4500-CO2D	NA	DRY	378	465	650			670		< 5	DRY	1110
Calcium	mg/L	EPA 200.7	NA	DRY	119	113	127			164		904	DRY	24.9
Chemical Oxygen Demand	mg/L	HACH 8000	NA	DRY	39	18	< 10			< 10		260	DRY	130
Chloride	mg/L	EPA 300.0	250*	DRY	27	445	5	2340	44	6	542	1410	DRY	2260
Fluoride	mg/L	EPA 300.0	4	DRY	0.1	< 0.1	< 0.1			< 0.1		< 0.1	DRY	< 1.0
Iron	mg/L	EPA 200.7	0.3*	DRY	5.35	38.4	1.2			< 0.05		1.28	DRY	1.05
Magnesium	mg/L	EPA 200.7	NA	DRY	47.7	44.3	119			80.9		1.5	DRY	14.3
Manganese	mg/L	EPA 200.7	0.05*	DRY	0.07	0.46	0.35			0.89		0.07	DRY	0.04
Nitrate Nitrogen	mg/L as N	EPA 300.0	10	DRY	1.77	< 0.05	< 0.05			< 0.05		0.27	DRY	1.11
pH, Field	su	FLD	NA	DRY	6.43	6.08	6.71	5.88	5.88	6.42	6.57	12.4	DRY	7.46
pH, Lab	su	SM4500-H+B	NA	DRY	7.55	7.11	7.71	6.86	7.05	7.74	7.51	12.2	DRY	8.12
Potassium	mg/L	EPA 200.7	NA	DRY	1.9	7.7	3.4			3.6		28.4	DRY	6.4
Sodium	mg/L	EPA 200.7	NA	DRY	26.4	409	59.8			13.9		441	DRY	1910
Specific Conductance, Field	umhos/cm	FLD	NA	DRY	1068	2681	1502	8863	1297	1275	3536	8873	DRY	7872
Specific Conductance, Lab	umhos/cm	EPA 120.1	NA	DRY	963	2550	1540	6340	1320	1280	3560	8500	DRY	8020
Sulfate	mg/L	EPA 300.0	250*	DRY	137	307	318			119		< 10	DRY	< 10
Alkalinity to pH 4.5	mg/L as CaCO3	SM 18 2320B	NA	DRY	379	466	653			673		1250	DRY	1120
Total dissolved solids	mg/L	SM2540-C	NA	DRY	560	1520	1030			778		3970	DRY	4520
Total Organic Carbon	mg/L	SM 18 5310-C	NA	DRY	4	10.6	2.6	40.2	4.3	1.9	25.3	29	DRY	28
Phenolics, total	ug/L	EPA 420.1	4000	DRY	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0	28	DRY	< 20.0
Turbidity	NTU	EPA 180.1	NA	DRY	594	122	25.5			14.2		20.9	DRY	6.4
Organics														
Benzene	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	< 5.0	10.9	112	< 5.0	< 5.0	< 5.0	DRY	< 5.0
1,2-Dibromoethane	ug/L	EPA 8260B	0.05	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
1,1-Dichloroethane	ug/L	EPA 8260B	27	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
1,1-Dichloroethene	ug/L	EPA 8260B	7	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
1,2-Dichloroethane	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
cis-1,2-Dichloroethene	ug/L	EPA 8260B	70	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
trans-1,2-Dichloroethene	ug/L	EPA 8260B	100	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Ethylbenzene	ug/L	EPA 8260B	700	DRY	< 5.0	< 5.0	< 5.0	< 5.0	11.1	< 5.0	< 5.0	< 5.0	DRY	< 5.0
Methylene Chloride	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Tetrachloroethene	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Toluene	ug/L	EPA 8260B	1000	DRY	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0
1,1,1-Trichloroethane	ug/L	EPA 8260B	200	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Trichloroethene	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Vinyl Chloride	ug/L	EPA 8260B	2	DRY	< 2.0	< 2.0	< 2.0			< 2.0		< 2.0	DRY	< 2.0
Total Xylene	ug/L	EPA 8260B	10000	DRY	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0
Additional Parameters														
Chromium	mg/L	EPA 200.7	0.10	DRY	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		DRY	< 0.01
Chromium, dissolved	mg/L	EPA 200.7D	0.10	DRY	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		DRY	< 0.01
Naphthalene	ug/L	EPA 8260B	100	DRY	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0		DRY	< 5.0
Total Organic Halogen	ug/L	EPA 9020B	NA	DRY	22	64	< 20	435	28	< 20	217		DRY	405

MCL = Maximum Contaminant Level (EPA Federal Drinking Water Standards or Pennsylvania DEP Statewide Health Standards for used aquifers in a residential setting where EPA Standard does not exist)
* These values represent secondary MCLs.
Dry Points: MW-201R, MW-310R, MW-P2U, SP-4

TABLE 3

KELLY RUN SANITATION LANDFILL
PA DEP I.D. NO. 100663

SECOND QUARTER 2010
RESULTS OF CHEMICAL ANALYSES PERFORMED ON GROUNDWATER AND SURFACE WATER

				GROUNDWATER									
Chemical Constituent	**Unit**	**Analytical Method No.**	**MCL**	**MW-312**	**MW-P1U**	**MW-P1D1**	**MW-P1D2**	**MW-P2U**	**MW-P2D1**	**MW-P2D2**	**MWPZ-1**	**MWPZ-2**	**MWPZ-3**
Inorganics													
Ammonia Nitrogen	mg/L as N	EPA 350.1&D	NA	21	0.47	0.4	0.1	DRY	< 0.10	< 0.10			
Bicarbonate	mg/L as CaCO3	SM 4500-CO2D	NA	1010	518	493	471	DRY	274	198			
Calcium	mg/L	EPA 200.7	NA	174	169	140	130	DRY	115	110			
Chemical Oxygen Demand	mg/L	HACH 8000	NA	310	< 10	< 10	< 10	DRY	< 10	< 10			
Chloride	mg/L	EPA 300.0	250*	1760	69	72	97	DRY	54	47	151	171	199
Fluoride	mg/L	EPA 300.0	4	< 0.1	0.2	0.2	< 0.1	DRY	0.1	0.2			
Iron	mg/L	EPA 200.7	0.3*	1.92	0.27	1.08	< 0.05	DRY	< 0.05	0.17			
Magnesium	mg/L	EPA 200.7	NA	91.8	46.9	41.7	35.2	DRY	41.6	39.4			
Manganese	mg/L	EPA 200.7	0.05*	0.05	1.89	0.23	0.92	DRY	< 0.01	< 0.01			
Nitrate Nitrogen	mg/L as N	EPA 300.0	10	1.18	< 0.05	< 0.05	< 0.05	DRY	0.48	0.4			
pH, Field	su	FLD	NA	6.51	6.57	6.82	6.42	DRY	6.53	6.57	7.23	7.4	6.43
pH, Lab	su	SM4500-H+B	NA	7.39	7.67	7.62	7.38	DRY	7.5	7.52	8.16	8.34	7.48
Potassium	mg/L	EPA 200.7	NA	19.5	3.9	2.9	2.5	DRY	3.9	3.9			
Sodium	mg/L	EPA 200.7	NA	1180	111	109	110	DRY	48.9	31.7			
Specific Conductance, Field	umhos/cm	FLD	NA	6364	1372	1294	1221	DRY	991.6	888.2	2793	2780	2740
Specific Conductance, Lab	umhos/cm	EPA 120.1	NA	6720	1390	1320	1320	DRY	1020	918	2680	2960	2790
Sulfate	mg/L	EPA 300.0	250*	< 10	191	146	118	DRY	200	240			
Alkalinity to pH 4.5	mg/L as CaCO3	SM 18 2320B	NA	1010	520	495	472	DRY	275	199			
Total dissolved solids	mg/L	SM2540-C	NA	3620	880	792	786	DRY	652	606			
Total Organic Carbon	mg/L	SM 18 5310-C	NA	59.5	2.4	2.1	3.5	DRY	1.4	1.3	5.6	6.2	9.6
Phenolics, total	ug/L	EPA 420.1	4000	21	< 20.0	< 20.0	< 20.0	DRY	< 20.0	< 20.0			
Turbidity	NTU	EPA 180.1	NA	23.5	14.3	32.7	0.6	DRY	0.8	9.3			
Organics													
Benzene	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
1,2-Dibromoethane	ug/L	EPA 8260B	0.05	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
1,1-Dichloroethane	ug/L	EPA 8260B	27	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
1,1-Dichloroethene	ug/L	EPA 8260B	7	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
1,2-Dichloroethane	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
cis-1,2-Dichloroethene	ug/L	EPA 8260B	70	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
trans-1,2-Dichloroethene	ug/L	EPA 8260B	100	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
Ethylbenzene	ug/L	EPA 8260B	700	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
Methylene Chloride	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
Tetrachloroethene	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
Toluene	ug/L	EPA 8260B	1000	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
1,1,1-Trichloroethane	ug/L	EPA 8260B	200	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
Trichloroethene	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
Vinyl Chloride	ug/L	EPA 8260B	2	< 2.0	< 2.0	< 2.0	< 2.0	DRY	< 2.0	< 2.0			
Total Xylene	ug/L	EPA 8260B	10000	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0	< 5.0			
Additional Parameters													
Chromium	mg/L	EPA 200.7	0.10	< 0.01				DRY					
Chromium, dissolved	mg/L	EPA 200.7D	0.10	< 0.01				DRY					
Naphthalene	ug/L	EPA 8260B	100	< 5.0				DRY					
Total Organic Halogen	ug/L	EPA 9020B	NA	555				DRY			51	124	76

MCL = Maximum Contaminant Level (EPA Federal Drinking Water Standards or Pennsylvania DEP Statewide Health Standards for used aquifers in a residential setting where EPA Standard does not exist)
* These values represent secondary MCLs.
Dry Points: MW-201R, MW-310R, MW-P2U, SP-4

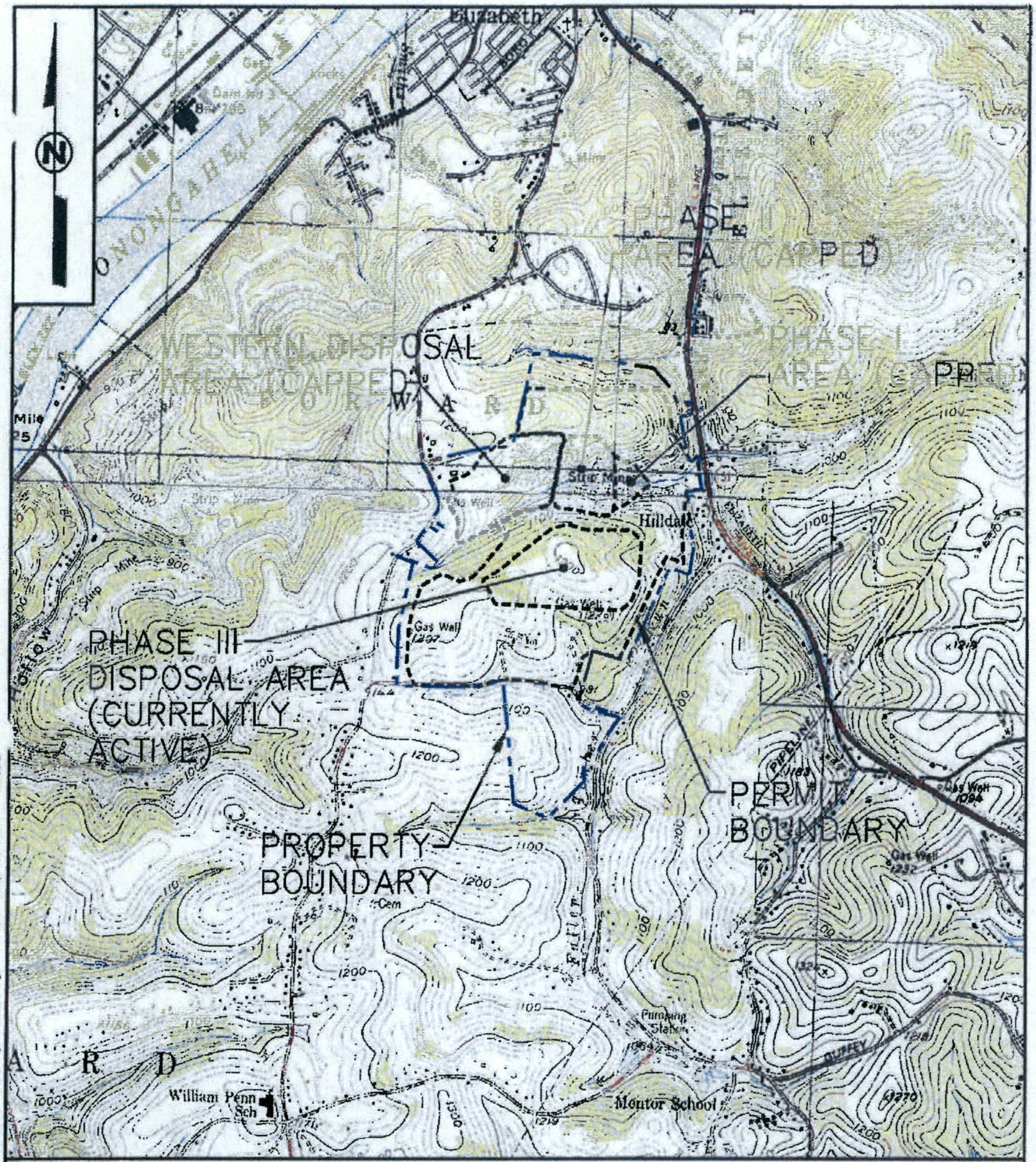
TABLE 3

KELLY RUN SANITATION LANDFILL
PA DEP I.D. NO. 100663

SECOND QUARTER 2010
RESULTS OF CHEMICAL ANALYSES PERFORMED ON GROUNDWATER AND SURFACE WATER

Chemical Constituent	Unit	Analytical Method No.	MCL	SURFACE WATER						
				KR-2	FTR-2	ST-2	ST-3	ST-5	SP-3	SP-4
Inorganics										
Ammonia Nitrogen	mg/L as N	EPA 350.1&D	NA	< 0.10	0.38	< 0.10	< 0.10	< 0.10	< 0.10	DRY
Bicarbonate	mg/L as CaCO3	SM 4500-CO2D	NA	204	165	146	173	144	402	DRY
Calcium	mg/L	EPA 200.7	NA	69.4	68.3	68.3	67.5	69.5	126	DRY
Chemical Oxygen Demand	mg/L	HACH 8000	NA	17	60	91	45	46	< 10	DRY
Chloride	mg/L	EPA 300.0	250*	88	81	52	152	133	52	DRY
Fluoride	mg/L	EPA 300.0	4	0.1	0.1	0.1	0.1	0.1	< 0.1	DRY
Iron	mg/L	EPA 200.7	0.3*	4.36	6.55	12.2	5.97	2.27	0.38	DRY
Magnesium	mg/L	EPA 200.7	NA	26.6	18.6	15.7	21.9	17	82.1	DRY
Manganese	mg/L	EPA 200.7	0.05*	0.54	0.45	0.89	0.29	0.26	0.26	DRY
Nitrate Nitrogen	mg/L as N	EPA 300.0	10	0.37	0.35	0.31	0.4	0.63	1.48	DRY
pH, Field	su	FLD	NA	7.99	7.97	8.05	8.01	8.24	6.75	DRY
pH, Lab	su	SM4500-H+B	NA	8.3	8.14	8.1	8.2	8.01	7.8	DRY
Potassium	mg/L	EPA 200.7	NA	3.5	3.6	4.2	2.6	2.3	3.3	DRY
Sodium	mg/L	EPA 200.7	NA	76.5	73.7	40	98.4	78.2	28.8	DRY
Specific Conductance, Field	umhos/cm	FLD	NA	757	745	539	897	835	1211	DRY
Specific Conductance, Lab	umhos/cm	EPA 120.1	NA	777	766	543	916	707	1210	DRY
Sulfate	mg/L	EPA 300.0	250*	63	93	40	66	47	236	DRY
Alkalinity to pH 4.5	mg/L as CaCO3	SM 18 2320B	NA	208	167	148	176	145	404	DRY
Total dissolved solids	mg/L	SM2540-C	NA	462	434	314	506	452	794	DRY
Total Organic Carbon	mg/L	SM 18 5310-C	NA	4.6	5.7	6.9	7.6	8.1	2.4	DRY
Phenolics, total	ug/L	EPA 420.1	4000	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0	DRY
Turbidity	NTU	EPA 180.1	NA	185	208	396	177	255	5.1	DRY
Organics										
Benzene	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,2-Dibromoethane	ug/L	EPA 8260B	0.05	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,1-Dichloroethane	ug/L	EPA 8260B	27	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,1-Dichloroethene	ug/L	EPA 8260B	7	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,2-Dichloroethane	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
cis-1,2-Dichloroethene	ug/L	EPA 8260B	70	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
trans-1,2-Dichloroethene	ug/L	EPA 8260B	100	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Ethylbenzene	ug/L	EPA 8260B	700	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Methylene Chloride	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Tetrachloroethene	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Toluene	ug/L	EPA 8260B	1000	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,1,1-Trichloroethane	ug/L	EPA 8260B	200	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Trichloroethene	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Vinyl Chloride	ug/L	EPA 8260B	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	DRY
Total Xylene	ug/L	EPA 8260B	10000	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Additional Parameters										
Chromium	mg/L	EPA 200.7	0.10							DRY
Chromium, dissolved	mg/L	EPA 200.7D	0.10							DRY
Naphthalene	ug/L	EPA 8260B	100							DRY
Total Organic Halogen	ug/L	EPA 9020B	NA							DRY

MCL = Maximum Contaminant Level (EPA Federal Drinking Water Standards or Pennsylvania DEP Statewide Health Standards for used aquifers in a residential setting where EPA Standard does not exist)
* These values represent secondary MCLs.
Dry Points: MW-201R, MW-310R, MW-P2U, SP-4



REFERENCE
U.S.G.S. 7.5 MINUTE TOPOGRAPHIC QUADRANGLE MAPS OF GLASSPORT, MCKESSPORT, MONOGAHELA AND DONORA, PA

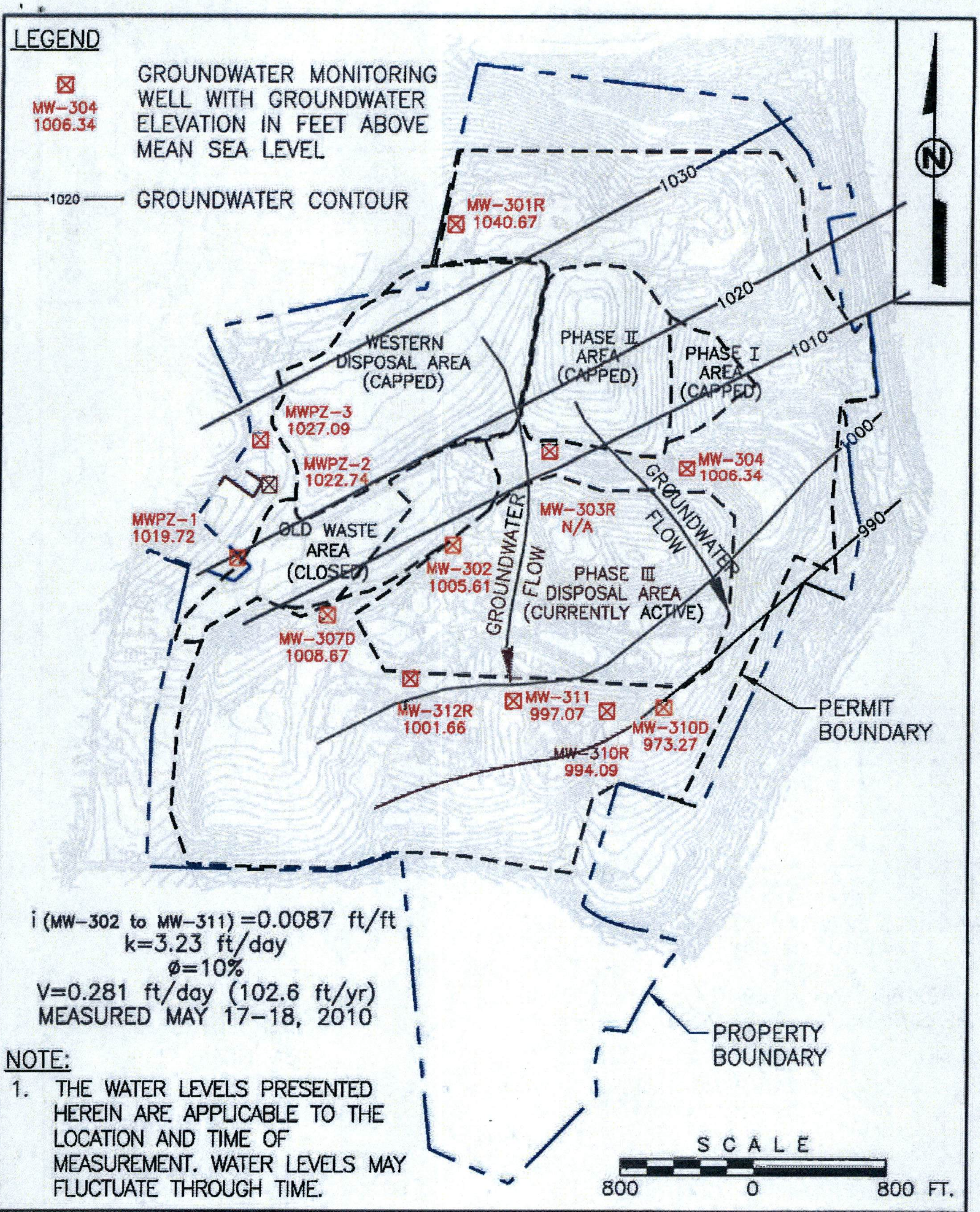
SCALE
2000 0 2000 FT.

Civil & Environmental Consultants, Inc.
EXPORT, PA PITTSBURGH, PA
(724) 327-5200 • (412) 429-2324
Cincinnati, OH • Columbus, OH • Indianapolis, IN • Nashville, TN

U.S.G.S. SITE LOCATION MAP

KELLY RUN LANDFILL
PERMIT NO. 100663

DWN. BY: JHG	SCALE:	DATE:	PROJECT NO.:	
CHKD. BY: RST	AS SHOWN	08/19/05	050558	FIGURE NO. 1



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Cincinnati, OH • Columbus, OH • Indianapolis, IN • Nashville, TN

BENWOOD LIMESTONE POTENTIOMETRIC MAP
KELLY RUN LANDFILL
PERMIT NO. 100663

DWN. BY: JHG	SCALE:	DATE:	PROJECT NO.:	
CHKD. BY: RST	AS SHOWN	08/17/10	050-558.0210	FIGURE NO. 2

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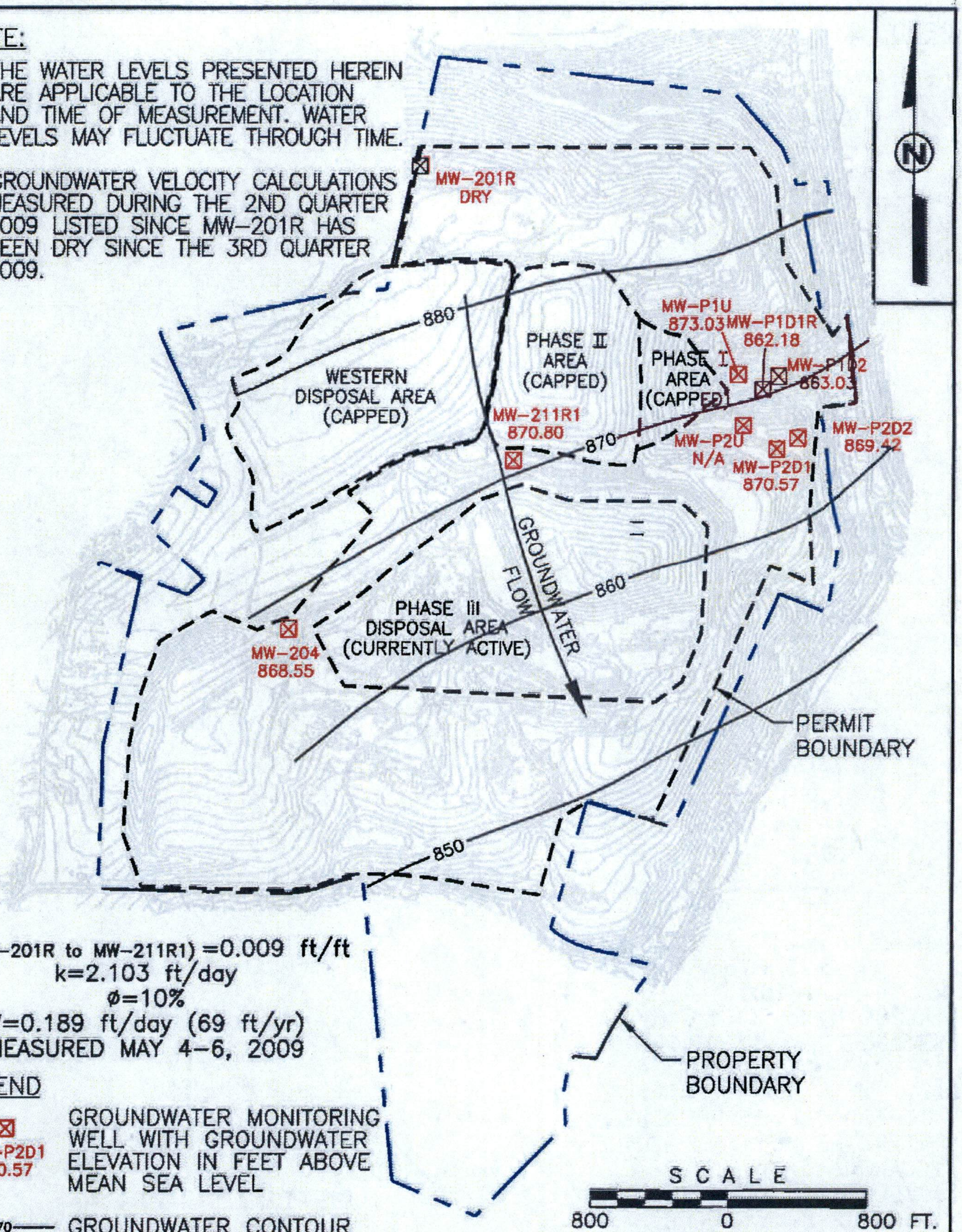
NOTE:

1. THE WATER LEVELS PRESENTED HEREIN ARE APPLICABLE TO THE LOCATION AND TIME OF MEASUREMENT. WATER LEVELS MAY FLUCTUATE THROUGH TIME.
2. GROUNDWATER VELOCITY CALCULATIONS MEASURED DURING THE 2ND QUARTER 2009 LISTED SINCE MW-201R HAS BEEN DRY SINCE THE 3RD QUARTER 2009.



i (MW-201R to MW-211R1) $=0.009$ ft/ft
$k=2.103$ ft/day
$\phi=10\%$
$V=0.189$ ft/day (69 ft/yr)
MEASURED MAY 4-6, 2009

LEGEND

MW-P2D1 870.57 — GROUNDWATER MONITORING WELL WITH GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL

—870— GROUNDWATER CONTOUR

CEC
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PITTSBURGH COAL
POTENTIOMETRIC MAP
KELLY RUN LANDFILL
PERMIT NO. 100663

DWN. BY: JHG	SCALE:	DATE:	PROJECT NO.:	
CHKD. BY: RST	AS SHOWN	08/17/10	050-558.0210	FIGURE NO. 3

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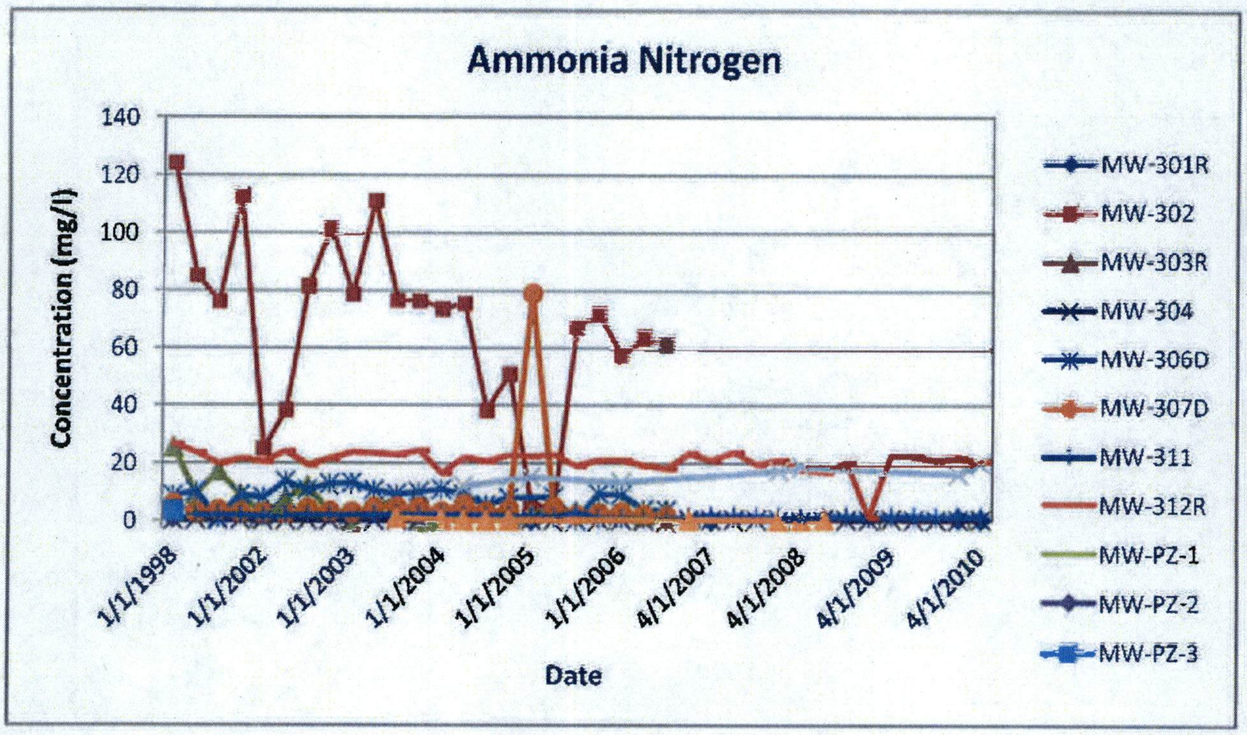
FIGURE 4

KELLY RUN SANITATION, INC
BENWOOD LIMESTONE
TIME SERIES PLOTS



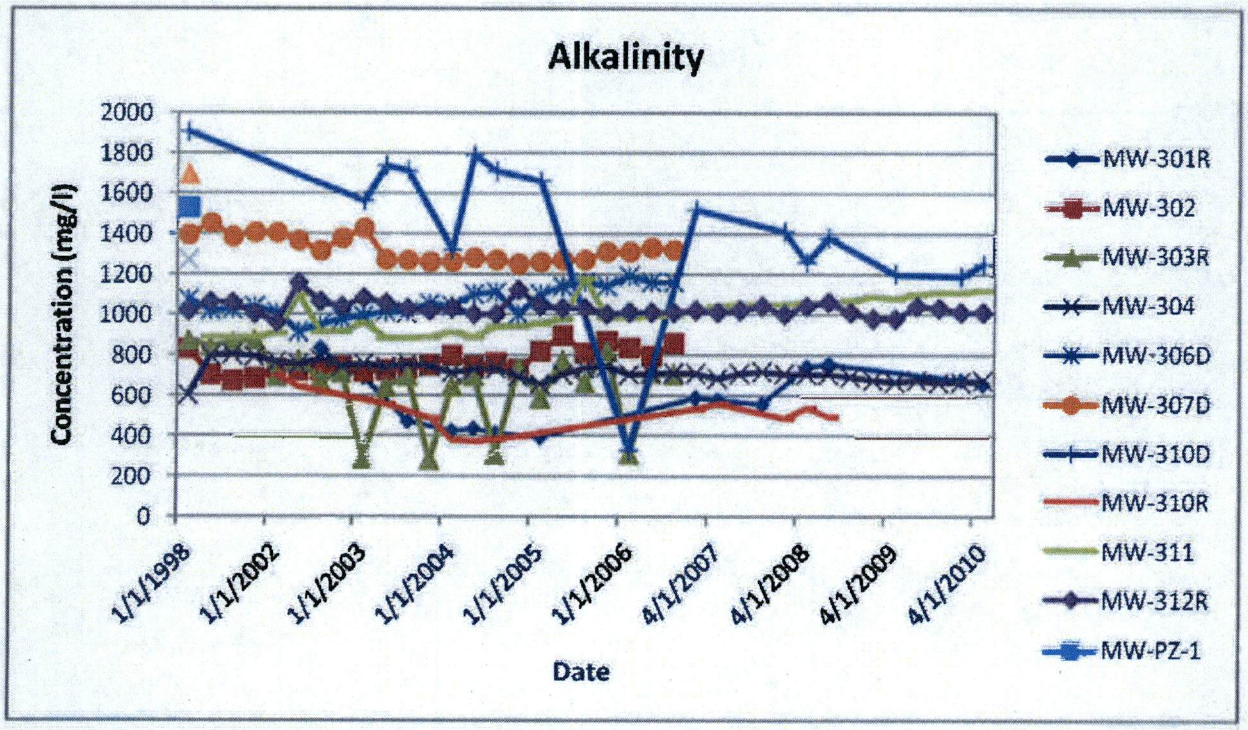
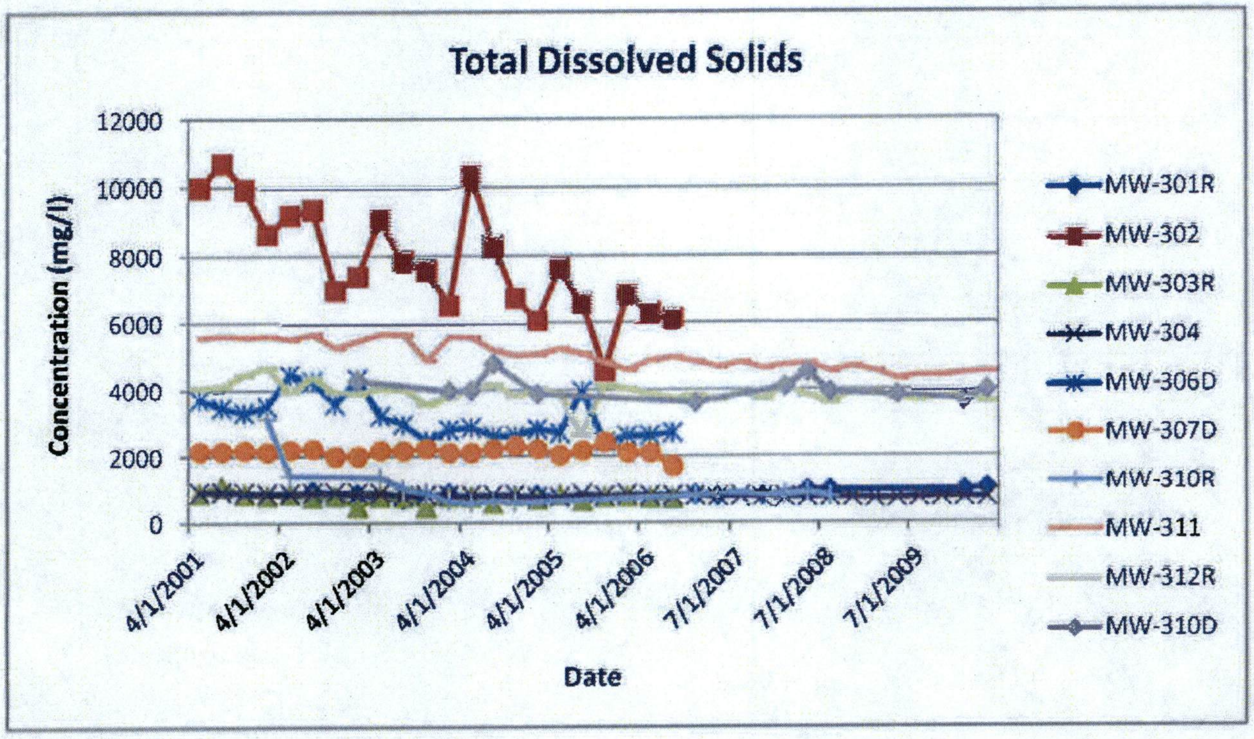


FIGURE 4

KELLY RUN SANITATION, INC
BENWOOD LIMESTONE
TIME SERIES PLOTS



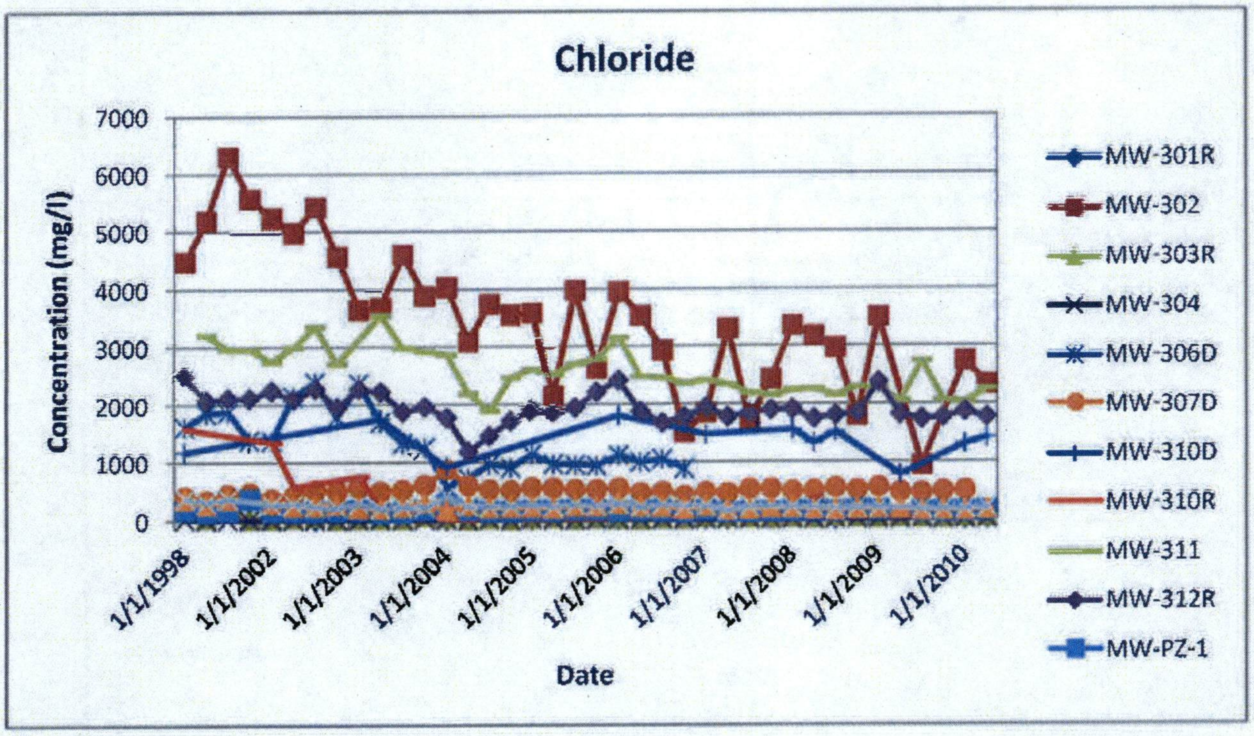


FIGURE 4

KELLY RUN SANITATION, INC
BENWOOD LIMESTONE
TIME SERIES PLOTS

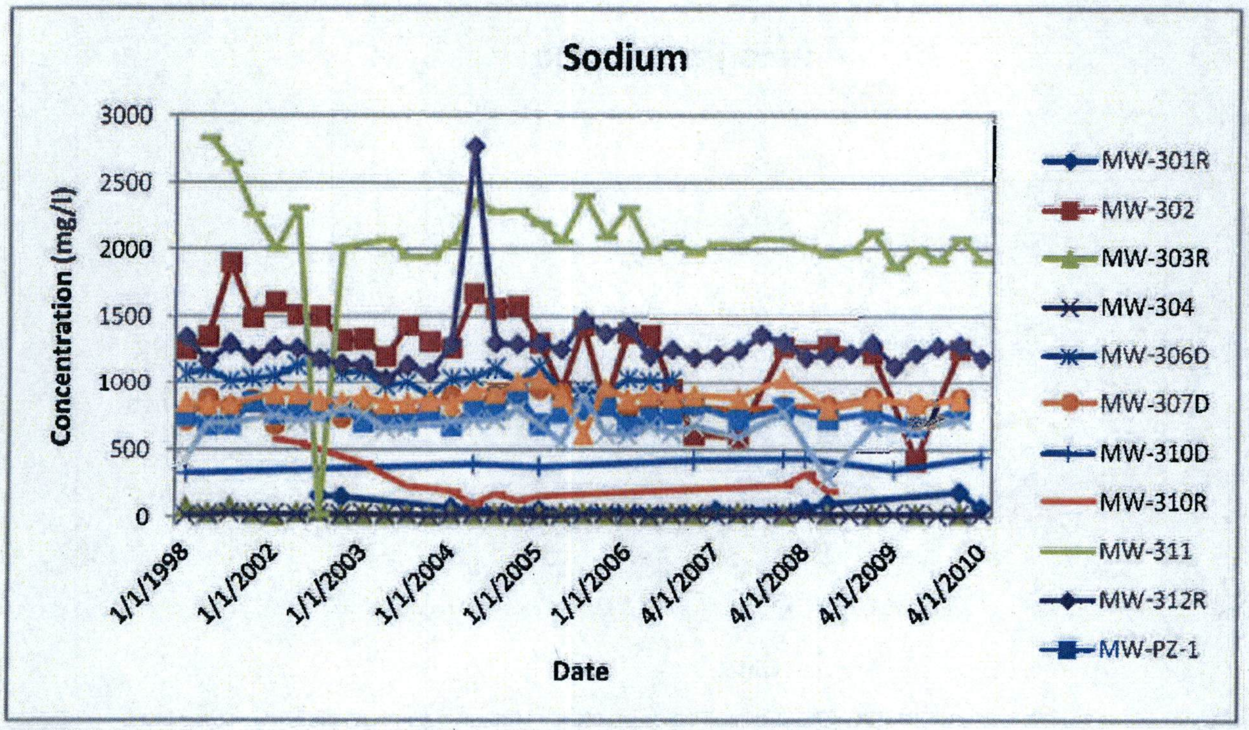
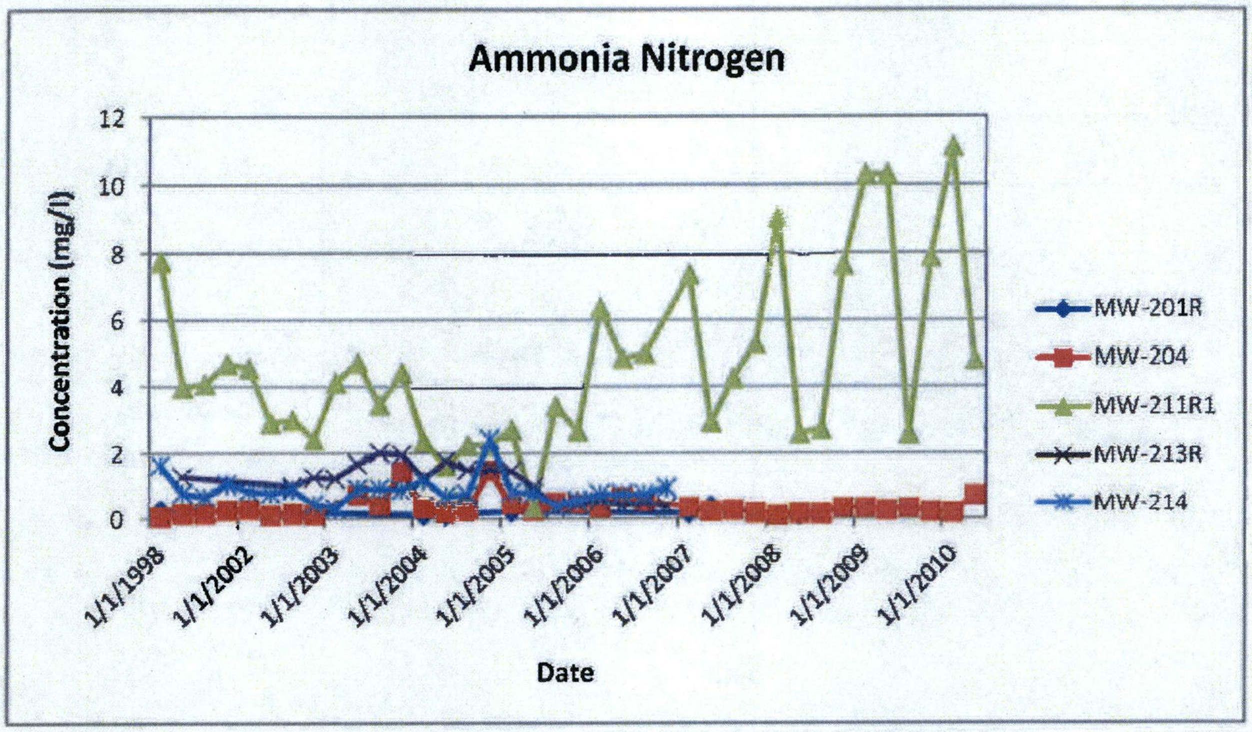


FIGURE 5

KELLY RUN SANITATION, INC
PITTSBURGH COAL
TIME SERIES PLOTS



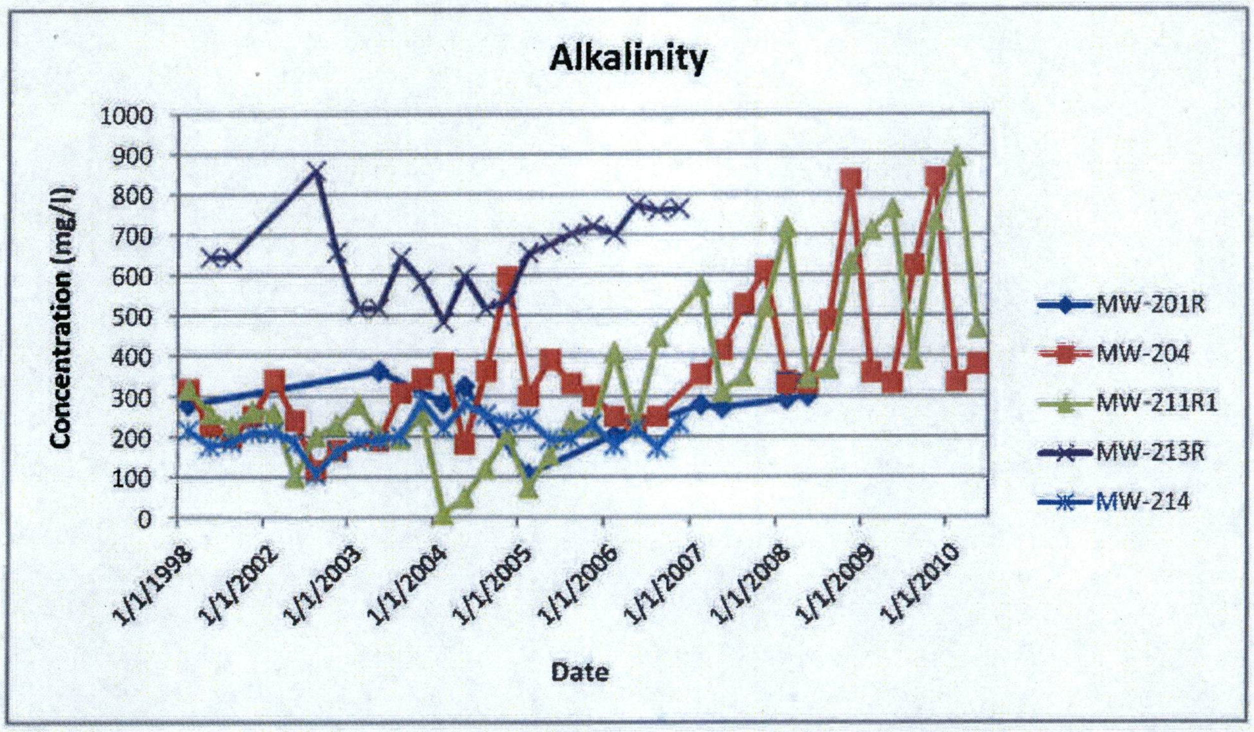
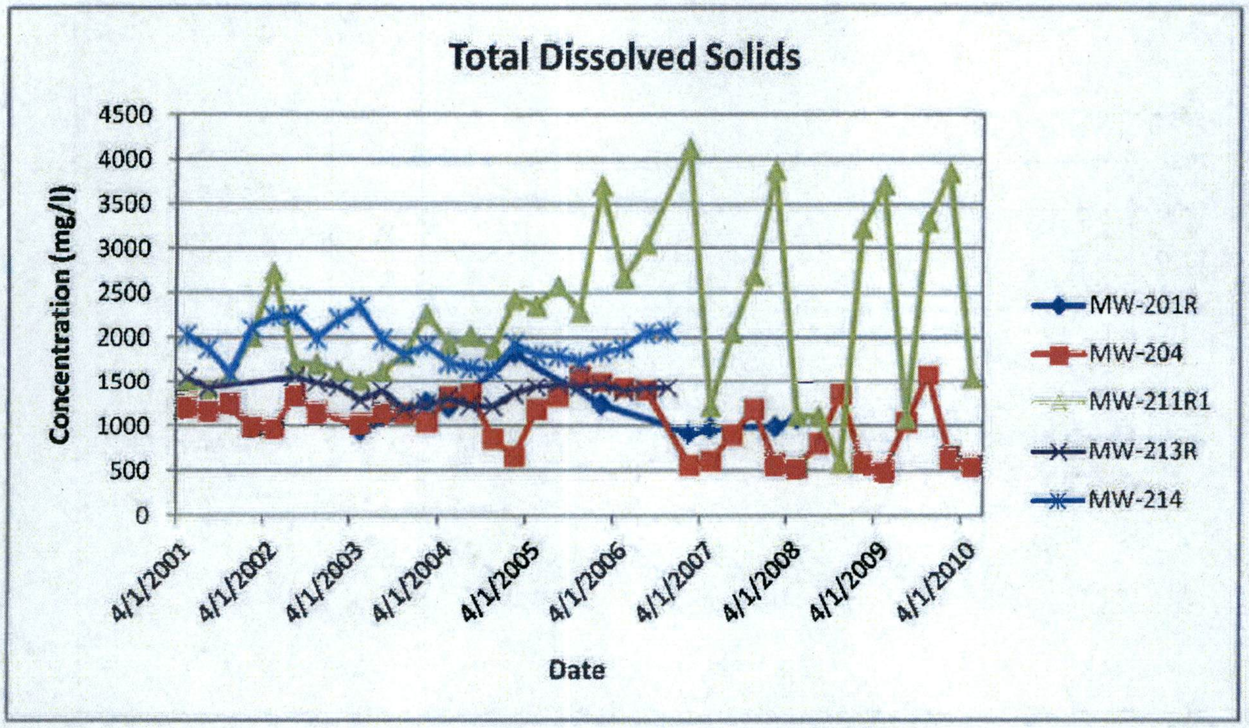


FIGURE 5

KELLY RUN SANITATION, INC
PITTSBURGH COAL
TIME SERIES PLOTS



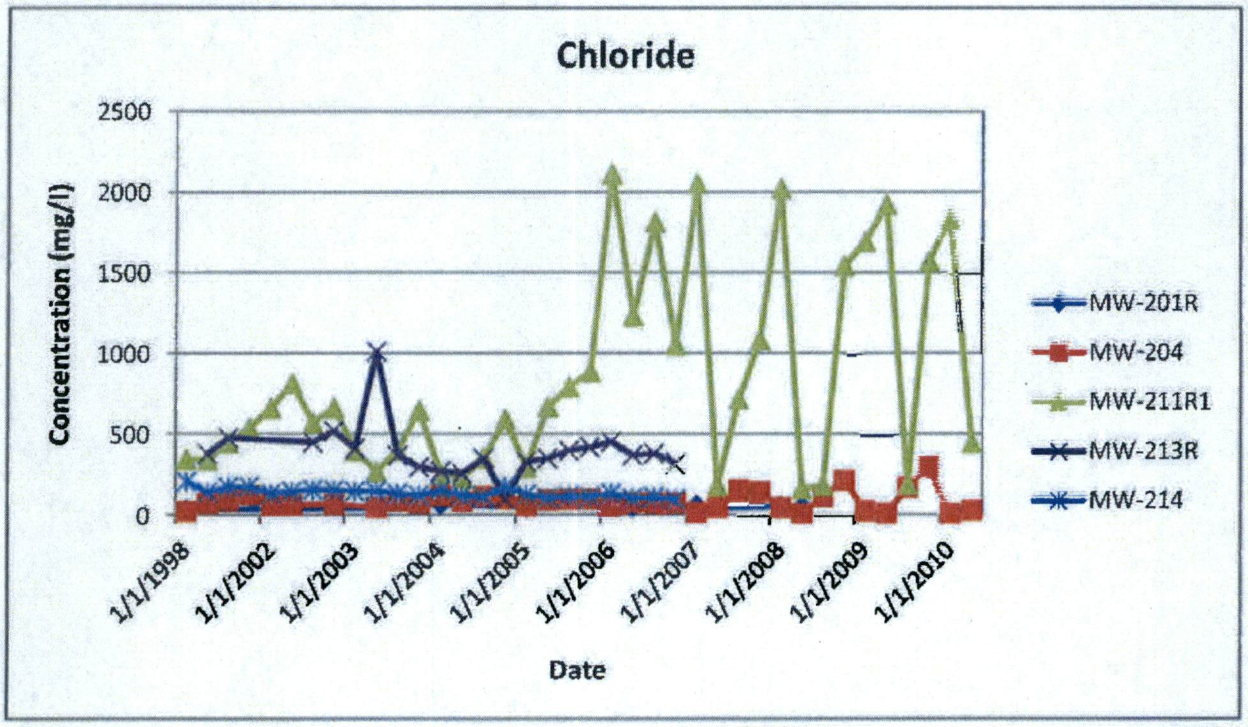


FIGURE 5

KELLY RUN SANITATION, INC
PITTSBURGH COAL
TIME SERIES PLOTS

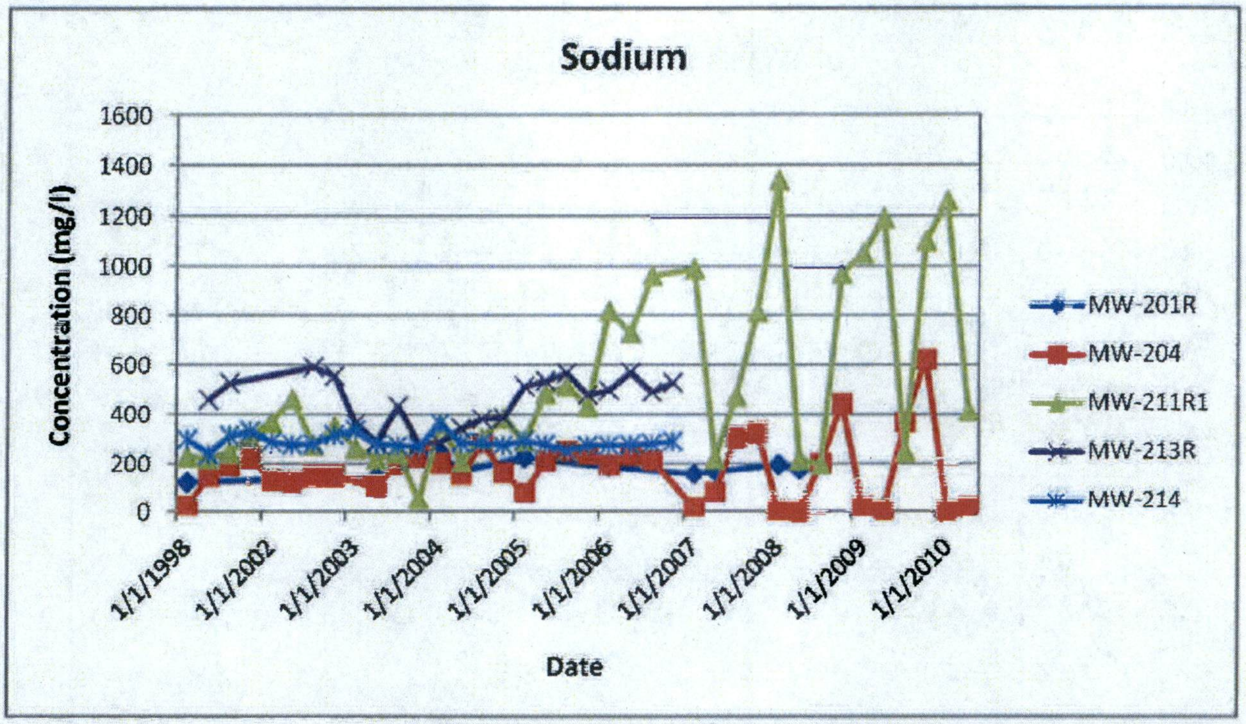
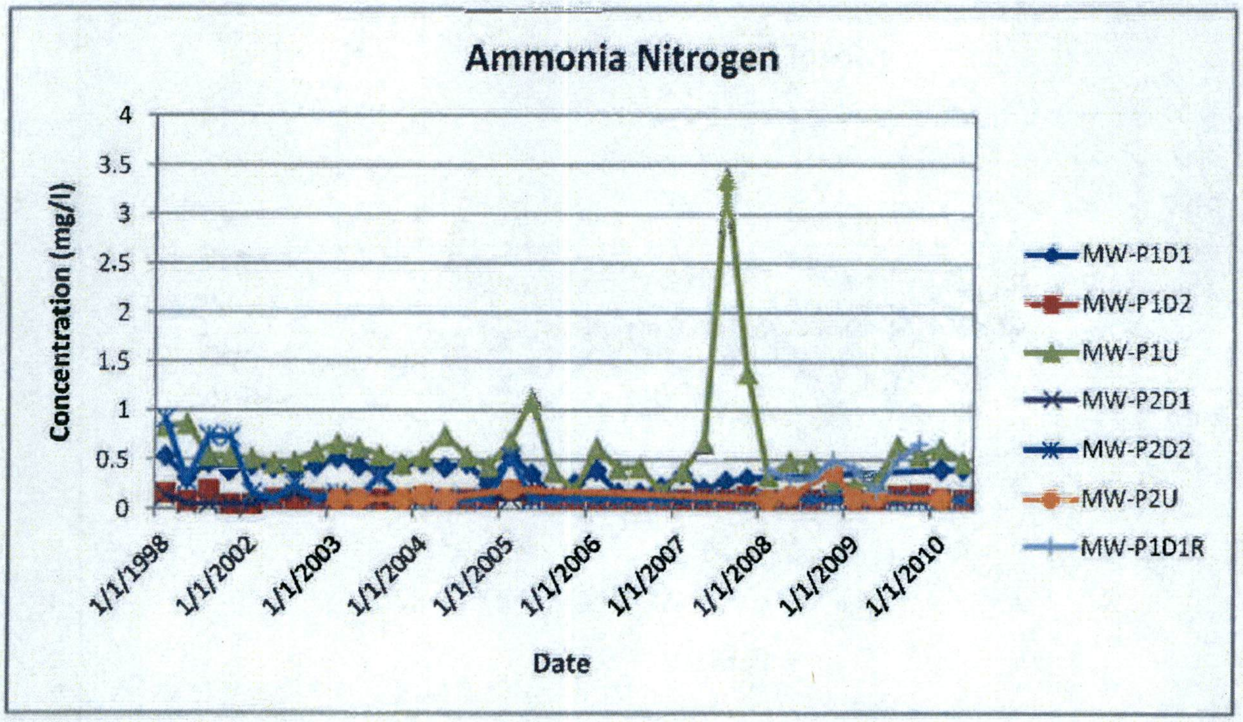


FIGURE 6

KELLY RUN SANITATION, INC
LEACHATE POND
TIME SERIES PLOTS



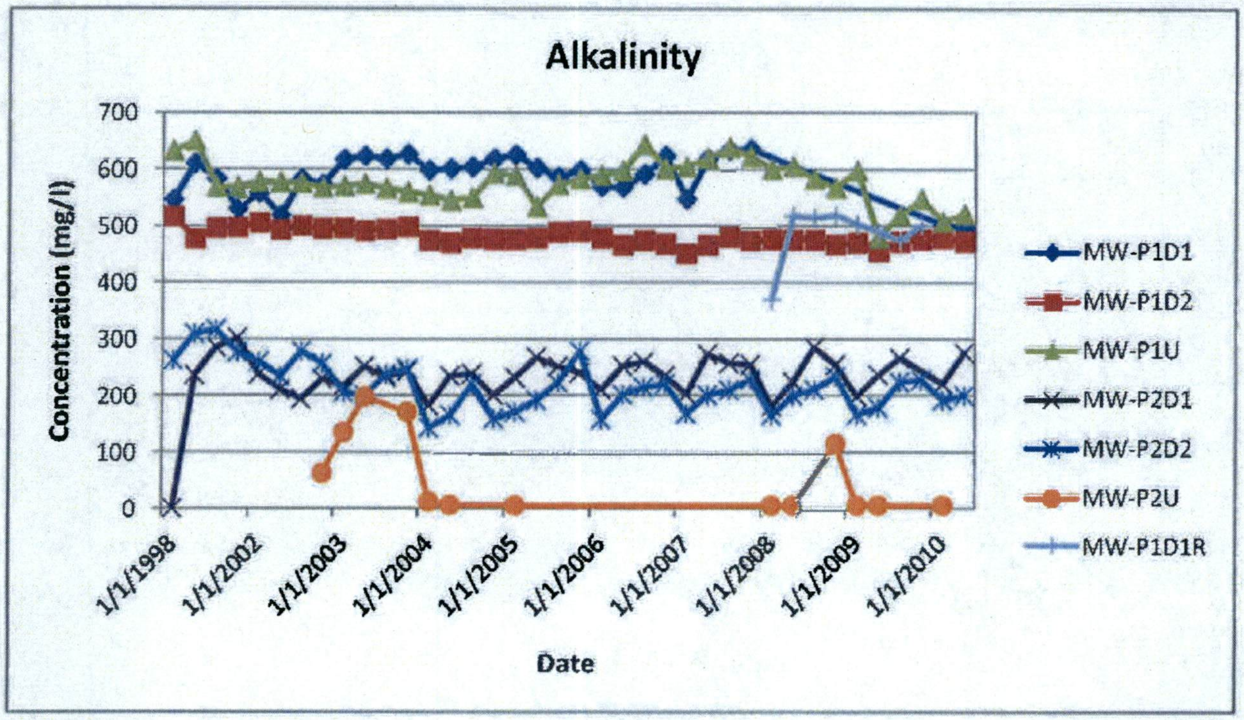
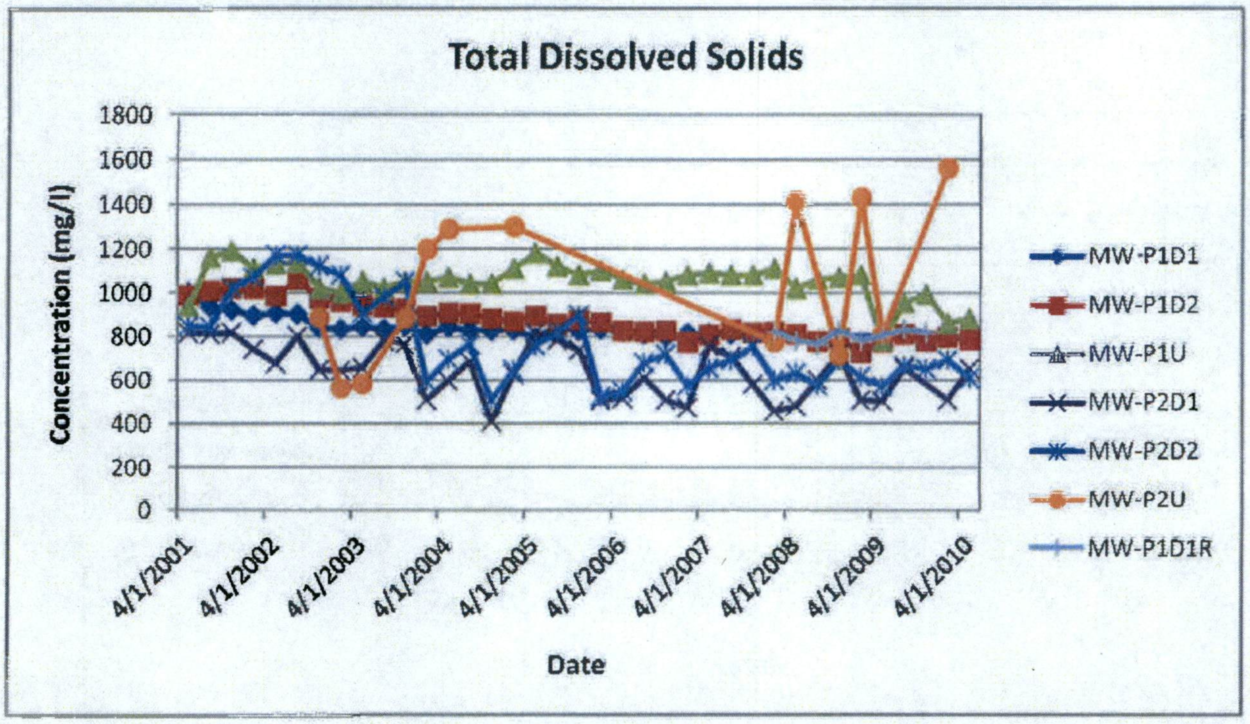


FIGURE 6

KELLY RUN SANITATION, INC
LEACHATE POND
TIME SERIES PLOTS



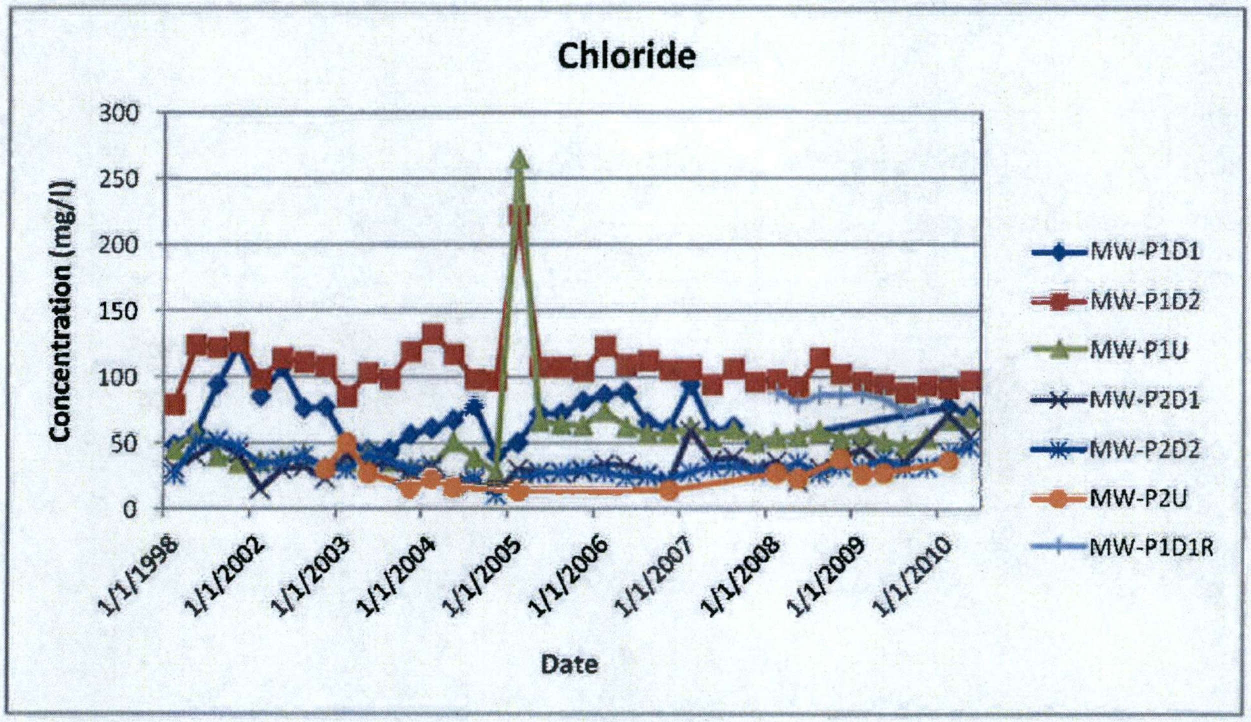
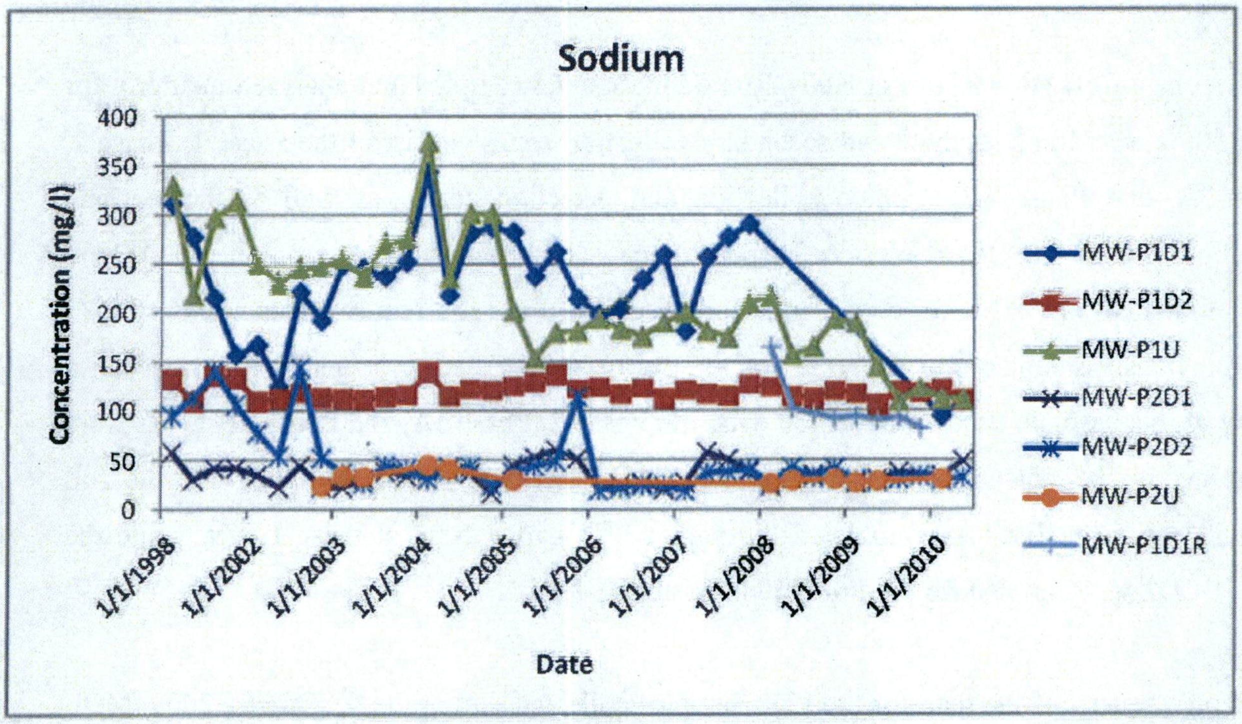


FIGURE 6

KELLY RUN SANITATION, INC
LEACHATE POND
TIME SERIES PLOTS



APPENDIX D
LEACHATE SAMPLING AND ANALYSIS

The Leachate Collection Zones at Kelly Run Sanitation are sampled and analyzed quarterly for Form 50. Kelly Run's leachate and secondary collection zones consist of the Phase 1, Phase 2, Phase 3A, and Phase 3B leachate collection and detection zones, as well as the leachate collection zone for the closed Western Disposal Area. The Leachate Detection Zones (LDZ) are sampled annually (4th Quarter event) in accordance with Form 50 requirements. These LDZs were previously sampled and analyzed for the Form 50 LDZ indicator analytes. Based on a review of this baseline fluid composition data, the Phase 2, Phase 3A, and Phase 3B LDZs were determined to be potentially leachate influenced. Therefore, annual sampling for the full Form 50 parameter list was completed during the 4th Quarter 2009 at these LDZs, while the Phase 1 LDZ was sampled for the Form 50 indicator analytes.

Based on a review of the data for the LDZ samples collected during the 4th Quarter 2009, MCL exceedances were noted. Therefore, the Form 19 detection zone add-on list was included in the annual groundwater sampling program completed during the 1st Quarter 2010.

APPENDIX E
METHANE PROBE MONITORING

1.0 INTRODUCTION

The following methane monitoring report is a summary and evaluation of the gas monitoring and control activities for the Kelly Run Sanitation, Inc. Landfill (KRS) located in Forward Township, Allegheny County, Pennsylvania for the quarterly period ending June 30, 2010. Results of the quarterly gas probe monitoring data collected on May 27 – June 22, 2010 are submitted herein as part of the KRS Quarterly Monitoring Report.

1.1 BACKGROUND

KRS Landfill currently maintains and utilizes a system of landfill gas monitoring probes to monitor for the presence of methane. The current system includes 133 probes located spatially around the landfill boundaries (13 probes were decommissioned prior to the 4th Quarter 2006 event in accordance with the August 14, 2006 WDA Permit). The landfill gas monitoring probes are generally constructed of a single perforated PVC well casing installed at a shallow depth, often referred to as the "A" zone. Nested probes (two or three probes at the same location) monitor for the presence of methane in the shallow ("A"), intermediate ("B"), and deep ("C") zones.

The majority of gas monitoring probes in both the Western and Municipal Disposal Areas are screened within the Benwood Limestone Aquifer. Some of the shallow probes monitor the Waynesburg and Uniontown Formations above the Benwood Limestone. Deeper probes monitor the Sewickley, Redstone, and Pittsburgh Sandstones.

1.2 REPORTING REQUIREMENTS

The monitoring of landfill gas (methane) concentrations is conducted on a quarterly basis following the requirements set forth in PA Code Title 25 Section 273.292, Gas Control and Monitoring and Pennsylvania Department of Environmental Protection (PADEP) Permit Conditions.

PA Code 273.292 provides the following criteria to determine the regulatory compliance of combustible gas levels at the landfill:

1. 25% of the lower explosive limit (LEL) at a structure within the landfill site.
2. The LEL at the boundaries of the landfill site.
3. 25% of the LEL in an adjacent area, including buildings or structures on adjacent areas.

The maximum acceptable combustible gas concentrations permitted under current regulatory and permit requirements is 5.0% methane in air. This concentration is equal to 100% of the LEL. Concentrations above the maximum acceptable limit of 5.0% are reported to PADEP and the Allegheny County Health Department (ACHD). In the event an exceedance of this limit occurs in a given monitoring probe, daily monitoring of the probe is initiated and continued until the methane level reaches acceptable limits. Persistent exceedances occasionally require additional gas extraction efforts in those areas.

1.3 LANDFILL GAS MONITORING PROCEDURES

Written protocols for conducting methane monitoring were established in accordance with Permit Condition No. 21 of the Solid Waste Landfill Permit Modification dated February 6, 1997 and the August 14, 2006 WDA Permit.

The Landfill Gas Monitoring Procedures for obtaining methane concentration readings from the monitoring probes were submitted to PADEP in a report dated April 7, 1997. Specifically, the

procedures address the need to maintain the proper instrument calibration, obtain and document all necessary readings, evaluate probe water levels, and the dewatering of probes were necessary. KRS conducted the landfill gas monitoring according to these approved procedures. In addition, any liquids removed during probe dewatering are disposed of into the leachate manhole consistent with the requirements of the March 13, 1996 Consent Decree.

2.0 LANDFILL GAS MONITORING

The landfill gas monitoring system consists of both single and nested design probes. All 133 gas monitoring probes were tested for the presence of methane. The following Gas Monitoring Probe Field Log presents a summary of the methane and LEL concentrations for each gas monitoring probe tested.

No methane was detected at the LEL level at any probe for this monitoring period.

3.0 CONCLUSIONS

The LEL concentration was not detected at any monitoring probe. Therefore, all methane gas monitoring probes in the KRS network continue to demonstrate compliance with the acceptable regulatory limit of 5.0%.

APPENDIX F
DUST FALL ANALYSIS

Dust collection analysis is performed monthly through the placement of dust fall jars around Kelly Run Sanitation Landfill. The jars are collected monthly and fresh jars are placed in the holders.

No samples exceeded the maximum dust fall of 1.5 mg/cm^2/month during the 2nd Quarter 2010 as specified in the PA 25 §273.217 and cited in PA 25§131.3 except total suspended solids and total dissolved solids at DFC-3 during the months of May and June, and total dissolved solids at DFC-6 during the month of May. The laboratory case narratives describe the May DFC-3 sample as containing brown water with a lot of dirt and bugs; the May DFC-6 sample as containing brown water with pieces of leaves, bugs, and dirt; and the June DFC-3 sample as containing cloudy dark brown water with leaves, seeds, bugs, and worms.

WASTE MANAGEMENT

KELLY RUN SANITATION, INC. LANDFILL
FORWARD TOWNSHIP, ALLEGHENY COUNTY
PENNSYLVANIA
PADEP I.D. NO. 100663

QUARTERLY REPORTING REQUIREMENTS

FIRST QUARTER 2010

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May 2010

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1.0 INTRODUCTION

1.1 SCOPE AND PURPOSE

This report summarizes the results of the 1st Quarter 2010 groundwater monitoring activities at Kelly Run Sanitation, Inc. Landfill (KRS). This work was conducted on March 8 – 10, 2010 to satisfy requirements of the Pennsylvania Department of Environmental Protection (PADEP). KRS operates a municipal waste landfill (Permit I.D. No. 100663) in Forward Township, Allegheny County.

KRS has been operating since 1965 and consists of five disposal units (Figures 1, 2, and 3):

- 17-acre pre-RCRA disposal area identified as the Old Waste Area (OWA) has been closed since early 1970s and was capped in 1997;
- A 9.0-acre Phase I Area closed municipal waste landfill, that was capped in 1996 (operating permit issued March 14, 1991);
- A 24.3-acre Phase II Area closed municipal waste landfill, that was capped in 1998 (operating permit issued January 18, 1995);
- A Phase III Area active municipal waste landfill (operating permit issued February 6, 1997); and
- The 35.0-acre Western Disposal Area (WDA), a closed and capped hazardous waste landfill (Hazardous Waste Postclosure Permit U.S. Environmental Protection Agency ID No. PAD004810222).

The Groundwater Monitoring Program at KRS incorporates permanent monitoring elements to provide environmental protection during and after landfill development. Field work, sampling methodologies, data evaluation, data QA/QC, and chemical analyses were conducted in accordance with the approved site permits.

1.2 SITE DESCRIPTION AND BACKGROUND

KRS currently receives municipal waste at a rate of about 8,000 tons per month. The facility consists of a 408-acre parcel, of which 48 acres are currently approved for active waste disposal. KRS is permitted to take municipal solid waste and other approved special wastes.

The WDA consists of approximately 35 acres and is a closed hazardous waste disposal landfill. The WDA was constructed with an engineered clay liner and leachate collection system (i.e., interceptor drain) and was capped with a very low density polyethylene (VLDPE) geomembrane in the early 1990s. The 17-acre OWA is a natural attenuation landfill that was capped in 1997. Phase I (9.0 acres) and Phase II (24.3 acres) landfill areas were constructed as lined landfills and were completely capped and closed in 1998. Both Phase I and Phase II have leachate detection zones. The Phase III area is a 48-acre permitted double-lined landfill with a leachate detection zone. The Phase III landfill is the only active waste placement area at the landfill and receives approximately 280 tons per day of solid waste.

2.0 GEOLOGY AND HYDROGEOLOGY

2.1 REGIONAL GEOLOGY

KRS is located within the Appalachian Physiographic Province (Heath, 1984). This province is characterized by relatively deeply incised valleys and low rolling hills. KRS is constructed within the head of a relatively deeply incised valley and upon the adjacent ridge to the south. The surficial bedrock geology of KRS consists of Paleozoic deposits of the Monongahela and Conemaugh Groups. No Quaternary sedimentary deposits exist at the site. The entire site area has been deep-mined for the Pittsburgh Coal.

2.2 LOCAL GEOLOGY

The Pennsylvanian-aged Monongahela Group is defined as the interval between the base of the Waynesburg Coal and the base of the Pittsburgh Coal. The Monongahela has an average thickness of 350 feet in this portion of southwestern Pennsylvania and consists of five units, from stratigraphically lowest to highest: Pittsburgh, Redstone, Sewickley, Uniontown, and Waynesburg. The Pittsburgh Formation consists of approximately 100 feet of coal, shale, limestone, and sandstone and is conformably overlain by the Redstone Formation. The Redstone is approximately 80 feet thick and includes the interval between the Redstone Limestone and the base of the Sewickley Coal. The Redstone Coal is approximately 2 to 4 feet thick and the Pittsburgh Coal seam is 8 to 9 feet thick.

2.2.1 Uniontown Formation

The Uniontown Formation, the uppermost unit exposed at KRS, consists of 50 to 90 feet of interbedded shale, claystone, limestone, and sandstone. Only 20 feet of the Upper Member of the Uniontown is exposed on the adjacent hilltops. The Lower Member of the Uniontown Formation rests conformably beneath the Upper Member. In this area, the Lower Member is approximately 30 to 35 feet thick. The basal unit of the Lower Member is the Uniontown Coal, which is usually represented by 12 to 18 inches of carbonaceous shale. The lithologic units above the Uniontown Coal are comprised of

interbedded sandstone and shale through the lower and middle parts of the member and interbedded calcareous shale and argillaceous limestones in the upper part. Both the Upper Member and the Lower Member are moderately to severely weathered in outcrops exposed by earth moving activities at the site.

2.2.2 Pittsburgh Formation

The Pittsburgh Formation is located stratigraphically between the Uniontown Coal at the top and the base of the Pittsburgh Coal. This formation has a thickness of about 255 feet at the site. The Pittsburgh Formation consists of five members, from stratigraphically highest to lowest: Upper Member, Sewickley Member, Fishpot Member, Redstone Member, and the Lower Member.

2.2.2.1 Upper Member - The Upper Member extends from the bottom of the Uniontown Coal to the top of the Benwood Limestone Bed in the Sewickley Member. The Upper Member is in the range of 80 to 90 feet thick at the site and is comprised of interbedded shale, claystone, and argillaceous limestone. Many of the shale and claystone beds are calcareous. There are four persistent limestone beds in the Upper Member that are identified from stratigraphically highest to lowest as Limestone D, Limestone C, Limestone B, and Limestone A (Dodge, 1985 and Johnson, 1929). These limestone beds were considered part of the Benwood Limestone in older geologic literature, but they have been divided into individual beds in the Upper Member in recent geologic information. The four limestone beds range in thickness from about 1-foot to as much as 10 feet thick, although where the limestone beds are thicker than about 2 feet, they commonly have thin interbedded shale or claystone partings several inches thick.

2.2.2.2 Sewickley Member - The Sewickley Member extends from the top of the Benwood Limestone at the top of the Sewickley Member to the base of the Sewickley Coal at the base of this member. In the Phase III landfill area and adjacent areas, the Sewickley Member is 50 to 60 feet thick. The Benwood, which is the dominant unit in this member, is comprised of interbedded argillaceous limestone, shale, claystone, and fine-grained sandstone beds. Individual limestone beds can be 5 to 6 feet thick, but are

typically about 2 feet thick. Calcareous shale, claystone, and fine-grained sandstone beds separate the limestone beds. The bottom 5 to 10 feet of the member is comprised of shale and includes the Sewickley Coal bed, which in this area is a carbonaceous shale bed up to 4 feet thick.

2.2.2.3 Fishpot Member - The Fishpot Member of the Monongahela Group occupies the interval from the bottom of the Sewickley Coal at the top to the top of a limestone bed, which is the uppermost bed in the underlying Redstone Member. The Fishpot Member has an average thickness of 20 feet at the site and is comprised of sandstone, limestone, and shale.

2.2.2.4 Redstone Member - The Redstone Member occupies the interval from the top of the limestone bed mentioned above to the bottom of the Redstone Coal. This member has a thickness in the range of 30 to 35 feet and is comprised of an argillaceous limestone bed in the upper 5 feet and is underlain by shale with some thin interbedded sandstone units. The Redstone Coal horizon, which is the basal unit of the member, varies in thickness from 2 to 4 feet thick within the area.

2.2.2.5 Lower Member - The Lower Member of the Monongahela Group occupies the interval from the bottom of the Redstone Coal at the top of the Member to the bottom of the Pittsburgh Coal at the base of the Member. The Lower Member is 70 to 80 feet thick and is comprised predominantly of shale and claystone. The Pittsburgh Coal, the basal unit in this Member, has been deep-mined under the entire site area. The coal has a thickness of 8 to 9 feet in the vicinity of the site. Mine maps for the underground mine workings indicate that the coal was mined by the complete retreat method after room-and-pillar mining (DEI, 1996a).

2.2.3 Conemaugh Group

Underlying the Monongahela Group is the Conemaugh Group. This group of rocks has a thickness of 550 to 600 feet in the western Pennsylvania area and is comprised of interbedded sandstone, shale, and claystone units with thin limestone beds and thin coal

beds that are not economically important resources. The Conemaugh Group lies below drainage in the area.

2.3 STRUCTURAL GEOLOGY

The Appalachian Physiographic Province is characterized by a series of low amplitude, symmetrical, and subparallel anticlines and synclines. Regionally, these fold axes trend roughly north/northeast-south/southwest. KRS is located on the east limb of the Roaring Run (Murrysville) Anticline and strata at the site generally strike N80° E and dip 2° SE.

2.4 SITE HYDROGEOLOGY

The monitoring well network targets the water-bearing zones where any potential impact would be observed at the earliest possible time. Two aquifers have been identified at KRS: the Benwood Limestone and the Pittsburgh Coal. Vertical gradients between the aquifers are generally downward (DEI, 1995).

2.4.1 Benwood Limestone Hydrostratigraphic Unit

Groundwater occurs under perched conditions within the Benwood Limestone (DEI, 1996a). Published reports indicate that the Benwood Limestone is a poor producer of groundwater in southern Allegheny County (Piper, 1933). Piper (1933) indicates that in this area the yields from the Benwood Limestone are small and erratic and a considerable proportion of wells completed into this unit are unsuccessful.

Groundwater flow direction is dictated by the gentle southeastward dip that occurs throughout the site area. The horizontal gradient is 0.0081 ft/ft (measured March 8 – 10, 2010; calculated from MW-302 to MW-311) (Figure 2). Discharge from the Benwood Limestone Hydrostratigraphic unit is primarily to springs in the site area and local surface water bodies. The unnamed tributary to Fallen Timber Run is the principal receiving stream downgradient of the site.

Groundwater within the Benwood occurs as a result of secondary porosity caused by joint and fracture planes occurring within the rock. Primary porosity occurring with the Benwood appears to be negligible (DEI, 1996a). Groundwater within the Benwood occurs at the base of this unit and downward vertical flow is restricted by the underlying carbonaceous shale of the Sewickley Coal horizon. Constant-rate pumping tests indicate that the measured hydraulic conductivity is approximately 1.14×10^{-3} cm/sec (3.23 ft/day) and calculated porosity is 10 percent (DEI, 1996a).

Wells drilled through the Benwood and completed in the Pittsburgh Coal are characterized by not having encountered groundwater. DEI (1996a and 1996b) noted that groundwater flow does not occur between the Benwood and the Pittsburgh Coal and the geochemical fingerprints for these individual hydrostratigraphic units are different.

Groundwater within the Benwood is classified as a calcium-magnesium bicarbonate type of water. However, groundwater sampled from wells located south (downgradient) of the WDA [reported from Benwood monitoring wells MW-302, MW-303 (redrilled as MW-303R), MW-305 (decommissioned), MW-306 (decommissioned), and MW-307] are dominant in sodium, chloride, or both sodium and chloride (DEI, 1996a).

2.4.2 Pittsburgh Coal Hydrostratigraphic Unit

The Pittsburgh Coal Hydrostratigraphic Unit consists of the remnant mine workings, voids, and stumps in the retreat-mined Pittsburgh Coal. Piper (1933) concluded from mining observations that the Pittsburgh Coal in this area is not generally a water-bearing unit. Groundwater quality in the Pittsburgh Coal is generally degraded due to the presence of elevated levels of metals and sulfate. DEI (1996b) reported that groundwater within the Pittsburgh Coal is, in general, a non-dominant cation sulfate type of water.

Groundwater in the Pittsburgh Coal occurs under unconfined conditions (DEI, 1996b). A mine pool probably exists downgradient of the landfill. Groundwater recovered from the generally dry Pittsburgh Coal groundwater monitoring wells shows an acid-mine drainage characteristic (i.e., elevated concentrations of sulfate, iron, magnesium,

aluminum). Further, springs issuing from the Pittsburgh Coal 1 to 2 miles downgradient of the landfill show no influence related to leachate indicator parameters, but do show elevated acid-mine drainage constituents (DEI, 1996b). Consequently, DEI (1996b) concluded that the Benwood aquifer is not draining to the Pittsburgh Coal.

The Pittsburgh Coal unit occurs approximately 210 feet below the base of the active landfill (double-lined Phase III area). The Pittsburgh Coal has a measured hydraulic conductivity of 7.42×10^{-4} cm/sec (2.103 ft/day) (DEI, 1996b). Groundwater flow in this unit is structurally controlled and generally follows dip slope to the south-southeast (Figure 3). The Pittsburgh Coal has a measured horizontal hydraulic gradient (measured May 4 – 6, 2009; calculated from MW-201R to MW-211R1) to the south of 0.009 ft/ft. The effective porosity of the Pittsburgh Coal is estimated at 10 percent (DEI, 1996b).

3.0 FIELD PROGRAM, MONITORING RESULTS, AND DISCUSSION

3.1 VISUAL INSPECTION PROGRAM

The visual inspection program was implemented at KRS to aid in the early detection of a potential release. The visual inspection program performed by the sampling team includes physical examination of any stresses in biological communities, unexplained changes in soil characteristics, visible signs of leachate migration (i.e., leachate seeps), potential water table mounding beneath the waste management unit, and any other change to the environment due to the waste management unit.

3.2 WELL NETWORK AND GROUNDWATER ELEVATION MEASUREMENTS

3.2.1 Well Network

Based on the August 14, 2006 revision to the WDA post-closure care permit, the groundwater detection monitoring program for the WDA and municipal waste landfills at KRS consists of 21 groundwater monitoring wells that monitor 2 groundwater units. Each monitoring well network targets the preferential flowpath for the facility.

Detection Monitor Well Network

Monitored Zone	Upgradient Wells	Downgradient Wells
Benwood Limestone (Leachate Pond 3/4)	MW-301R	MW-302, MW-303R, MW-304, MW-307D, MW-310D, MW-310R, MW-311, MW-312R, MWPZ-1, MWPZ-2, MWPZ-3
Pittsburgh Coal	MW-201R	MW-204, MW-211R1
Lower Leachate Pond (Pittsburgh Coal)	MW-P1U	MW-P1D1R, MW-P1D2
Upper Leachate Pond (Pittsburgh Coal)	MW-P2U	MW-P2D1, MW-P2D2

3.2.2 Groundwater Elevation Measurements

Prior to initiation of groundwater purging and sampling activities, depth to water and water level elevation (feet above mean sea level) were recorded to the nearest hundredth of a foot. Water levels were collected from a total of 19 monitoring wells (MW-303R is a groundwater recovery well, and MW-P2U reference elevation is not available). The water level measurements are utilized in preparation of groundwater contour maps to determine groundwater flow direction and gradient at the site.

Water level data were collected from March 8 – 10, 2010 using an electronic water level meter. Depth to groundwater was measured in each well and converted to elevations in feet above mean sea level (Table 2). Groundwater elevations for the 1st Quarter 2010 sampling event are generally comparable to historical groundwater elevation measurements.

Using water levels measured on March 8 – 10, 2010, potentiometric surface maps were prepared that depict a plan view of horizontal groundwater flow (Figures 2 and 3). Groundwater within the Benwood Hydrostratigraphic Unit generally flows to the south and southeast (Figure 2). Groundwater within the Pittsburgh Coal Hydrostratigraphic Unit generally flows to the south-southeast (Figure 3).

3.3 GROUNDWATER GRADIENT AND FLOW VELOCITY

The horizontal groundwater seepage velocity downgradient of the landfill was estimated using the following equation:

$$v = \frac{(K_h i)}{n_e}$$

Where:

- v = average groundwater velocity;
- K_h = aquifer horizontal conductivity;
- i = average hydraulic gradient; and
- n_e = effective aquifer porosity (Freeze and Cherry, 1979).

The potentiometric surface map (March 8 – 10, 2010) of the Benwood Hydrostratigraphic Unit indicates that groundwater flow in this unit is from northwest to southeast with a horizontal gradient of 8.1×10^{-3} ft/ft (Figure 2). The average horizontal velocity of the Benwood Hydrostratigraphic Unit is 2.62×10^{-1} ft/day (95.6 ft/year), based upon an average hydraulic conductivity of 1.14×10^{-3} cm/sec (3.23 ft/day) (DEI, 1996a) and effective porosity of 10 percent (DEI, 1996a).

The potentiometric surface map (May 4 – 6, 2009) of the Pittsburgh Coal Hydrostratigraphic Unit indicates that groundwater flow in this unit is from north-northwest to south-southeast with a horizontal gradient of 9.0×10^{-3} ft/ft (Figure 3). The average horizontal groundwater velocity of the Pittsburgh Coal Hydrostratigraphic Unit is 1.89×10^{-1} ft/day (69 ft/year), based upon an average hydraulic conductivity of 7.42×10^{-4} cm/sec (2.103 ft/day) (DEI, 1996b) and effective porosity of 10 percent (DEI, 1996b). Of note, 2nd Quarter 2009 water level measurements were used for groundwater velocity calculations in the Pittsburgh Coal Hydrostratigraphic Unit since MW-201R has remained dry since the 3rd Quarter 2009.

3.4 SAMPLING AND ANALYTICAL PROGRAM

3.4.1 Field Program

Field sampling activities for the groundwater monitoring wells for the 1st Quarter 2010 were conducted March 8 – 10, 2010 (Tables 1 and 2). Monitoring well purging and sampling activities were implemented in accordance with the site's Groundwater Sampling and Analysis Plan and site permit. Wells were purged and sampled using dedicated pump systems or hand bailers (Appendix C).

3.4.2 Laboratory Analysis and Monitoring Parameters

As described in the municipal site's Groundwater Sampling and Analysis Plan (CE Consultants, 1995) and the WDA's Groundwater Monitoring and Reporting Plan (MFG, Inc., 2003), the KRS Landfill monitoring list was selected based on an evaluation of site-specific information including background groundwater chemistry, leachate analytical results, and chemical detectability, mobility, and persistence. Monitoring wells

at the site are analyzed for PADEP Form 19 constituents and additional parameters at select wells in accordance with the recently revised (August 14, 2006) post-closure permit for the WDA.

DETECTION MONITORING
PADEP FORM 19 ANNUAL CONSTITUENTS

INORGANIC, METALS, AND GENERAL CHEMISTRY

Arsenic	Copper	Silver
Alkalinity, total*	Fluoride	Specific conductance,
Ammonia-nitrogen*	Lead	Field & Laboratory*
Barium	Iron	Sodium*
Bicarbonate (as $CaCO_3$)*	Magnesium*	Sulfate*
Cadmium	Manganese*	Total Organic Carbon*
Calcium*	Mercury	Total Dissolved Solids
Chemical Oxygen Demand*	Nitrate-Nitrogen	Total Phenolics
Chloride*	pH, Field & Laboratory*	Turbidity
Chromium	Potassium*	Zinc
	Selenium	* Indicator analyte

ORGANIC CHEMISTRY

Benzene	Dichlorodifluoromethane	4-Methyl-2-Pentanone
Bromoform	1,1-Dichloroethane	1,1,1,2-Tetrachloroethane
Bromomethane	1,1-Dichloroethene	1,1,2,2-Tetrachloroethane
Carbon Tetrachloride	1,2-Dichloroethane	Tetrachloroethene
Chlorobenzene	*cis*-1,2-Dichloroethene	Toluene
Chloroethane	*trans*-1,2-Dichloroethene	1,1,1-Trichloroethane
Chlorodibromomethane	1,2-Dichloropropane	1,1,2-Trichloroethane
3-Chloro-1-Propene	cis 1,3-Dichloropropene	Trichloroethene
1,2-Dibromoethane	trans 1,3-Dichloropropene	Trichlorofluoromethane
1,2-Dichlorobenzene	Ethylbenzene	1,2,3-Trichloropropane
1,3-Dichlorobenzene	Methyl chloride	Vinyl chloride
1,4-Dichlorobenzene	Methyl Ethyl Ketone	Xylene

ADDITIONAL CONSTITUENTS FOR:
MW-201, MW-204, MW-211R1, MW-P2U, MW-301R, MW-302R,
MW-303R, MW-304, MW-307, MW-310R, MW-311D, AND MW-312R

QUARTERLY PARAMETERS	ANNUAL PARAMETERS
Total Organic Halogen	Lead
Chromium	Arsenic
Naphthalene	Aluminum
Creosote	Cyanide

ADDITIONAL CONSTITUENTS FOR:
MW-PZ-1, MW-PZ-2, AND MW-PZ-3

QUARTERLY PARAMETER	SEMI-ANNUAL PARAMETER
Total Organic Halogen	Naphthalene

In addition to the above parameters, groundwater monitoring wells were analyzed for the parameters listed on Page 6 of the PADEP Form 19, the Subtitle D Detection Zone Add-On List (Appendix A). These parameters were added to the 1st Quarter annual constituent list due to MCL exceedances in KRS Landfill's leachate detection zones. All water samples collected at the site were delivered to Geochemical Testing, Inc. in Somerset, PA for chemical analysis. Geochemical Testing is certified in the Commonwealth of Pennsylvania for performing chemical analysis of the reported parameters. Original laboratory reports detail specific reporting limits (Appendices A, B, and C).

3.5 ANALYTICAL PROGRAM RESULTS

The 1st Quarter 2010 sampling event was performed March 8 – 10, 2010. Thirteen wells were sampled for Form 19 parameters. Thirteen wells were sampled for WDA Post-Closure parameters. Additional constituents were analyzed for several Benwood Limestone and Pittsburgh Coal monitoring wells. One field duplicate, one field blank, and two trip blanks were also collected.

3.6 GEOCHEMICAL ANALYSIS

KRS submits a quarterly report that discusses groundwater quality from all of the monitoring wells specified in the PADEP approved permit. The permit requires quarterly sampling for Form 19 parameters and time-series evaluation of leachate indicator parameters. The time versus concentration plots were analyzed for significant trends of a given constituent, unexpected geochemical signatures, and anomalously high results.

3.6.1 Volatile Organic Compounds

The Benwood Limestone Hydrostratigraphic Unit has been shown to contain BTEX and naphthalene through several assessment reports (DEI, 1996a) and remediation of the aquifer was also addressed in a 1996 Consent Order and the August 14, 2006 WDA Permit. Further, Benwood Limestone groundwater monitoring well MW-303R is a recovery well that has operated continuously as part of the remediation of the groundwater since 1996.

Several volatile organic compounds have historically been detected in Benwood Limestone groundwater monitoring wells. For the 1st Quarter 2010 sampling event, benzene was detected in MW-302R (44.4 µg/L) and MW-303R (11 µg/L); ethylbenzene was detected in MW-302R (6.2 µg/L); acetone was detected in MW-310 (74.4 µg/L) and MW-312 (44.9 µg/L); chlorobenzene was detected in MW-312 (8 µg/L); and methyl ethyl ketone was detected in MW-310 (10.4 µg/L). In addition, acetone was detected in Pittsburgh Coal monitoring well MW-204 (25 µg/L). Concentrations for each of the detections are within historical levels for each monitoring point, and except for benzene, each of these detections is well below the corresponding Pennsylvania Act 2 Statewide Health Standard for the parameter. Volatile organic compounds were not detected above established reporting limits in any other wells.

Acetone, an annual constituent, was previously detected in MW-204 (92.0 µg/L), MW-310 (83.0 µg/L), and MW-312 (79.8 µg/L) during the 1st Quarter 2006. The 1st Quarter 2010 detections of acetone in these monitoring points do not correlate to a rise in leachate indicator parameters (Figures 4 and 5), nor does the geochemistry of groundwater at each location indicate a leachate influence (Figures 7 through 10). In addition, these wells are low recharge wells with water levels near or below the top of the screened interval. A review of the well logs for each of these wells indicates that bentonite pellets were used as the annular seal immediately above the sandpack. Coated bentonite pellets, which were commonly used in groundwater monitoring wells when these wells were constructed (late 1980's to mid 1990's), are a well documented source of acetone. Considering the limited water column in these wells and that the geochemistry does not indicate a leachate influence, the acetone detections most likely represent a leaching effect from the bentonite pellet seal rather than a reflection of actual groundwater quality.

Methyl ethyl ketone is an annual constituent, and with the exception of the 2009 annual sampling event, has been detected at MW-310D since 2005. The 2010 concentration of methyl ethyl ketone at MW-310D (10.4 μg/L) is with historical range for this well. Limited water column is typically available at MW-310D, which is purged dry immediately during the sampling events. Due to the exposed screen interval present at this well and absence of a leachate fingerprint in the groundwater geochemistry, it is possible the methyl ethyl ketone detections relate to subsurface migration of landfill gas.

3.6.2 Time-Series Analysis

The time versus concentration plots of five leachate indicator parameters (ammonia nitrogen, alkalinity, TDS, chloride, and sodium) were analyzed for significant trends, unexpected geochemical signatures, and anomalously high results.

3.6.2.1 <u>Benwood</u> - As shown on the time-series chart (Figure 4), no significant upward trend in the concentration of any indicator parameter was noted for the Benwood Hydrostratigraphic Unit. Geochemical analyses show that groundwater from the Benwood is a calcium bicarbonate (MW-304) to a sodium chloride (MW-311 and MW-312) dominant water type which is roughly consistent with that observed from previous studies (e.g., DEI, 1996a) (Figures 7 and 8).

3.6.2.2 Pittsburgh Coal - As shown on the time-series chart (Figure 5), no significant upward trend in the concentration of any indicator parameter was noted for the Pittsburgh Coal Hydrostratigraphic Unit except ammonia nitrogen, alkalinity, and sodium at MW-211R1; and alkalinity and sodium at MW-204. However, concentrations for alkalinity and sodium at MW-204, and all five leachate indicator parameters at MW-211R1 appear to fluctuate seasonally. In addition, since the concentrations of sodium, chloride, and total dissolved solids are higher at MW-211R1 than that of leachate, trends observed at this monitoring well do not appear to be the result of a leachate influence. Groundwater from the Pittsburgh Coal can generally be characterized as a calcium bicarbonate (MW-204) to sodium chloride (MW-211R1) water type (Figures 9 and 10). Monitoring point MW-201R was dry during the 1st Quarter 2010 sampling event.

3.6.2.3 Leachate Pond Wells - No significant upward trend in the concentration of any indicator parameter was noted for the Pittsburgh Coal Hydrostratigraphic Unit in the lower and upper leachate pond areas except a slight increasing trend for total dissolved solids at MW-P2U (Figure 6). However, groundwater chemistry at MW-P2U differs from leachate, and groundwater from this portion of the Pittsburgh Coal characterizes, in general, as a calcium-bicarbonate to calcium-sulfate type of water (Figures 11 and 12).

3.6.2.4 Lysimeters - Two lysimeter sets (ML-1A and ML-2A) are located beneath the first two stages of the Phase III Area and are monitored for the presence of water. No water was detected in these lysimeters for the 1st Quarter 2010 sampling event indicating that the liner system is not leaking into the subsurface (Table 1).

3.6.3 Surface Water Analysis

Six surface water samples (KR-2, FTR-2, ST-2, ST-3, ST-5, and SP-3) were collected March 10, 2010 for Form 19 analysis (SP-4 was dry) in accordance with the revised Groundwater Monitoring and Reporting Plan approved with the August 14, 2006 WDA Permit. The SP-series surface water points monitor the Benwood which crops out along the southern portion of the landfill. Surface water points ST-2 and FTR-2 monitor Fallen Timber Run. Surface water point KR-2 monitors an unnamed tributary to Fallen Timber Run. Surface point ST-3 monitors an unnamed tributary upstream of ST-2, and ST-5 is upgradient of ST-3 on the unnamed tributary to Fallen Timber Run.

Analyses were generally consistent with the historical data for these monitoring points. Volatile organic compounds were not detected in any surface water samples for the 1st Quarter 2010.

4.0 LABORATORY AND FIELD QUALITY ASSURANCE AND QUALITY CONTROL

4.1 TRIP, FIELD, AND EQUIPMENT BLANKS

Two trip blanks, one field blank, and one duplicate sample were collected as part of the field sampling and analysis quality control/quality assurance activities. The field blank and trip blanks did not detect any constituents that would place the sampling event into question.

4.2 HOLDING TIMES

All samples submitted to Geochemical Testing were analyzed within the required holding times as determined by the analytical method.

4.3 SAMPLE SURROGATE RECOVERIES

Sample recovery analyses did not produce results that would place the sampling event into question (Appendix C).

4.4 METHOD BLANKS

No laboratory method blanks contained detectable concentrations of any constituents that would place the laboratory analyses into question (Appendix C).

4.5 LABORATORY CONTROL SPIKES

Laboratory control spikes performed on groundwater samples did not produce results that would place the sampling event into question (Appendix C).

4.6 INITIAL CALIBRATION, CONTINUING CALIBRATION, AND INTERNAL MACHINE STANDARDS

The laboratory reports that calibration and internal machine standards were maintained so as not to compromise the integrity of the sampling event (Appendix C).

4.7 DUPLICATE SAMPLES

Duplicate sample analysis results were generally consistent with the corresponding original sample results.

5.0 CONCLUSIONS

Samples were collected at KRS according to appropriate sampling procedures for Form 19 and Form 50 parameters and sent to Geochemical Testing in Somerset, PA. The following observations are noted for the 1st Quarter 2010 sampling event:

- The active and closed areas of KRS are underlain by two monitored hydrostratigraphic units: Benwood Limestone and the Pittsburgh Coal.
- KRS was sampled for Form 19 groundwater and surface water constituents on March 8 – 10, 2010.
- Several Benwood groundwater monitoring points were sampled for additional parameters in accordance with the August 14, 2006 WDA Permit.
- KRS leachate was sampled for Form 50 constituents on March 10 - 19, 2010.
- The Benwood Limestone Hydrostratigraphic Unit has a horizontal gradient to the south of 8.1×10^{-3} ft/ft, with a velocity of 0.262 ft/day (95.6 ft/year) (Figure 2).
- The Pittsburgh Coal Hydrostratigraphic Unit has a horizontal gradient to the south of 9.0×10^{-3} ft/ft, with a velocity of 0.189 ft/day (69 ft/year) (Figure 3).
- Volatile organic compounds were detected in Benwood Limestone groundwater monitoring wells MW-302R, MW-303R, MW-310, and MW-312; and Pittsburgh Coal groundwater monitoring well MW-204. Volatile organic compounds were not detected above established reporting limits in other surface water or in other groundwater monitoring wells.
- Time-series analyses indicate that there are no increasing trends in the leachate indicator parameters in groundwater at Kelly Run Landfill except for alkalinity and sodium at MW-204; ammonia nitrogen, alkalinity, and sodium at MW-211R1; and a slight increasing trend for total dissolved solids at MW-P2U. However, these rises do not appear to be the result of a leachate influence.

Based on a review of recent and historical data collected during routine monitoring events at KRS, the following observations are made:

- Groundwater elevation contour maps show that local groundwater gradient and velocity have been temporally consistent in both monitored groundwater units.
- Concentrations of trace metals and other inorganic constituents in groundwater samples were generally consistent with historical concentrations.
- Surface water analyses of metals and inorganic parameter concentrations are generally consistent with historical concentrations (Appendix B). The Benwood Spring continues to be collected and treated as leachate due to historical detections of volatile organic compounds.
- The Benwood Limestone Hydrostratigraphic Unit has been shown to historically contain BTEX and naphthalene through several assessment reports (DEI, 1996a) and remediation of the aquifer was also addressed in a 1996 Consent Order and the August 14, 2006 WDA Permit. Benwood groundwater monitoring well MW-303R is a recovery well that has operated continuously as part of Kelly Run's groundwater remediation efforts since 1996.

Therefore, the major conclusions of this report are:

1. Continued landfilling activities do not appear to be altering the existing groundwater conditions.
2. The groundwater monitoring network is capable of monitoring the Benwood and Pittsburgh Coal Hydrostratigraphic units.
3. The frequency of sampling and the constituents analyzed are appropriate for determining if a release has occurred.

6.0 REFERENCES

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TABLE 1

KELLY RUN LANDFILL
PADEP I.D. NO. 100663

FIRST QUARTER 2010
FIELD PARAMETERS

AQUIFER	MONITORING POINT	SAMPLE DATE	SAMPLE TIME	WATER LEVEL[1] (ft)	WELL DEPTH[1] (ft)	WATER VOLUME[2] (gallons)	THREE VOLUMES (gallons)	WATER PURGED (gallons)	VOLUMES PURGED	FIELD PARAMETERS pH	COND (µS/m)	TEMP (C)	COMMENTS
Benwood Limestone	MW-301R	03/09/2010	10:00 AM	134.20	135.85	1.07	3.22	0.80	0.75	6.36	1510	11.8	
	MW-302R	03/09/2010	10:40 AM	149.15	170.26	13.72	41.16	2.50	0.18	5.81	9305	17.4	
	MW-303R	03/10/2010	02:20 PM	NM	63.20	NM	NM	5.00	NM	5.85	1269	13.1	
	MW-304	03/10/2010	12:15 PM	47.20	64.15	11.02	33.05	1.50	0.14	6.11	1252	13.0	
	MW-307D	03/08/2010	12:50 PM	157.90	168.20	6.69	20.09	2.00	0.30	6.45	3607	12.8	
	MW-310D	03/09/2010	01:10 PM	126.00	128.84	1.85	5.54	2.50	1.35	12.19	8769	14.2	
	MW-310R	03/09/2010	DRY	104.85	108.81	2.57	7.72	2.00	0.78				Insufficient Water to Sample
	MW-311	03/09/2010	12:20 PM	102.90	116.85	9.07	27.20	0.80	0.09	7.23	7881	12.5	
	MW-312R	03/09/2010	11:30 AM	169.35	182.65	8.65	25.94	3.00	0.35	6.17	6202	13.3	
	PZ-1	03/08/2010	11:00 AM	99.20	119.32	13.08	39.23	2.50	0.19	7.18	2740	12.9	
	PZ-2	03/08/2010	10:30 AM	113.59	129.45	10.31	30.93	3.00	0.29	7.22	2932	13.3	
	PZ-3	03/08/2010	11:30 AM	95.70	111.08	10.00	29.99	2.00	0.20	6.39	2763	13.9	
Pittsburgh Coal	MW-201R	03/09/2010	DRY	DRY	276.44								Insufficient Water to Sample
	MW-204	03/08/2010	12:25 PM	295.80	310.00	9.23	27.69	4.00	0.43	6.37	433	12.7	
	MW-211R1	03/10/2010	01:20 PM	193.10	196.92	2.48	7.45	0.12	0.05	6.22	6747	14.4	
Lower Leachate Pond	MW-P1U	03/10/2010	11:20 AM	17.80	36.75	12.32	36.95	11.00	0.89	6.26	1360	13.9	
	MW-P1D1	03/10/2010	10:50 AM	28.70	38.82	6.58	19.73	3.50	0.53	6.61	1294	12.8	
	MW-P1D2	03/10/2010	10:20 AM	25.60	42.12	10.74	32.21	8.00	0.75	6.27	1302	12.4	
Upper Leachate Pond	MW-P2U	03/10/2010	09:30 AM	89.70	92.34	1.72	5.15	1.50	0.87	3.20	1680	7.5	
	MW-P2D1	03/09/2010	01:50 PM	92.60	96.50	2.54	7.61	1.00	0.39	6.14	815	9.8	
	MW-P2D2	03/10/2010	08:50 AM	92.50	98.61	3.97	11.91	2.00	0.50	6.12	974	10.2	
Surface Water	KR-2	03/10/2010	11:30 AM							6.15	540	11.1	
	FTR-2	03/10/2010	01:45 PM							7.51	757	12.9	
	ST-2	03/10/2010	01:30 PM							7.42	602	12.7	
	ST-3	03/10/2010	01:20 PM							7.15	651	12.9	
	ST-5	03/10/2010	01:00 PM							7.10	526	13.5	
	SP-3	03/10/2010	09:20 AM							6.36	996	11.7	
	SP-4	03/10/2010	DRY										Dry
Leachate	PHASE 1 DZ												Sampled Annually
	PHASE 2 DZ												Sampled Annually
	PHASE 3A DZ												Sampled Annually
	PHASE 3B DZ												Sampled Annually
	PHASE 1	03/10/2010	02:07 PM							6.25	3986	24.3	
	PHASE 2	03/19/2010	10:30 AM							6.50	1144	20.5	
	PHASE 3	03/10/2010	08:40 AM							6.11	3447	17.0	
	WDA LEACH.	03/10/2010	10:25 AM							5.91	987	17.7	
Phase III Subgrade Monitoring Pt.	ML-1A	03/10/2010	DRY										Lysimeter is Dry
	ML-2A	03/10/2010	DRY										Lysimeter is Dry

Notes:
[1] Measured from top of inner casing.
[2] Calculated from 0.65 gallons per foot of water
Sampled by Cody Salmon, Aquascape
ft = feet

C = Degrees Centigrade
µS/m = microSiemens/meter
gpm = gallons per minute
N/A = Not Applicable
NP = Not Provided

TABLE 2

KELLY RUN LANDFILL
PADEP I.D. NO. 100663

FIRST QUARTER 2010
WATER-LEVEL ELEVATIONS

AQUIFER	MONITORING POINT	GRADIENT POSITION	MEASUREMENT DATE	MEASUREMENT POINT ELEV.[1] (ft amsl)	WATER LEVEL[2] (ft)	WATER LEVEL ELEV. (ft amsl)
Benwood Limestone	MW-301R	U	03/09/2010	1169.67	134.20	1035.47
	MW-302R	D	03/09/2010	1154.41	149.15	1005.26
	MW-303R[3]	D	03/10/2010	NA	NM	NM
	MW-304	D	03/10/2010	1055.14	47.20	1007.94
	MW-307D	D	03/08/2010	1165.07	157.90	1007.17
	MW-310D	D	03/09/2010	1099.42	126.00	973.42
	MW-310R	D	03/09/2010	1099.39	104.85	994.54
	MW-311	D	03/09/2010	1100.37	102.90	997.47
	MW-312R	D	03/09/2010	1171.46	169.35	1002.11
	PZ-1	D	03/08/2010	1119.32	99.20	1020.12
	PZ-2	D	03/08/2010	1135.94	113.59	1022.35
	PZ-3	D	03/08/2010	1124.39	95.70	1028.69
Pittsburgh Coal	MW-201R	U	03/09/2010	1158.13	DRY	DRY
	MW-204	D	03/08/2010	1163.25	295.80	867.45
	MW-211R1	D	03/10/2010	1064.00	193.10	870.90
Lower Leachate Pond	MW-P1U	U	03/10/2010	892.73	17.80	874.93
	MW-P1D1	D	03/10/2010	891.18	28.70	862.48
	MW-P1D2	D	03/10/2010	888.43	25.60	862.83
Upper Leachate Pond	MW-P2U	U	03/10/2010	NA	89.70	NA
	MW-P2D1	D	03/09/2010	963.17	92.60	870.57
	MW-P2D2	D	03/10/2010	963.17	92.50	870.67

Notes:

[1] Elevation for the top of the PVC from well logs.
[2] Measured from the top of the 4" PVC riser pipe. Measured by Cody Salmon, Aquascape
[3] Groundwater Recovery Well

ft = foot
ft amsl = feet above mean sea level.
NA = Not Available
NM = Not Measured

TABLE 3

KELLY RUN SANITATION LANDFILL
PA DEP I.D. NO. 100663

FIRST QUARTER 2010
RESULTS OF CHEMICAL ANALYSES PERFORMED ON GROUNDWATER AND SURFACE WATER

				GROUNDWATER										
Chemical Constituent	Unit	Analytical Method No.	MCL	MW-201R	MW-204	MW-211R1	MW-301R	MW-302R	MW-303R	MW-304	MW-307	MW-310	MW-310R	MW-311
Inorganics														
Ammonia Nitrogen	mg/L as N	EPA 350.1&D	NA	DRY	0.18	11.1	0.75			0.28		16.2	DRY	1.69
Bicarbonate	mg/L as CaCO3	SM 4500-CO2D	NA	DRY	335	891	674			665		< 5	DRY	1100
Calcium	mg/L	EPA 200.7	NA	DRY	131	216	122			192			DRY	25.8
Calcium, dissolved	mg/L	EPA 200.7D	NA	DRY	127	214				181			DRY	25.1
Chemical Oxygen Demand	mg/L	HACH 8000	NA	DRY	33	200	22			13		160	DRY	140
Chloride	mg/L	EPA 300.0	250*	DRY	7	1840	8	2740	42	5	497	1300	DRY	2030
Fluoride	mg/L	EPA 300.0	4	DRY	< 0.1	< 0.1	< 0.1			< 0.1		< 0.1	DRY	< 0.1
Iron	mg/L	EPA 200.7	0.3*	DRY	0.72	30.6	3.33	3.75	3.11	0.09	2.53		DRY	1.35
Iron, dissolved	mg/L	EPA 200.7D	0.3*	DRY	< 0.05	32.3		2.96	2.89	0.08	2.16		DRY	1.03
Magnesium	mg/L	EPA 200.7	NA	DRY	58	94.5	81.7			92.9			DRY	15.7
Magnesium, dissolved	mg/L	EPA 200.7D	NA	DRY	56.5	92				92.7			DRY	15.4
Manganese	mg/L	EPA 200.7	0.05*	DRY	0.01	0.52	0.24	0.14	0.69	0.9	0.05		DRY	0.03
Manganese, dissolved	mg/L	EPA 200.7D	0.05*	DRY	< 0.01	0.53		0.11	0.67	0.91	0.04		DRY	0.02
Nitrate Nitrogen	mg/L as N	EPA 300.0	10	DRY	2.33	0.65	0.08			< 0.05		0.21	DRY	0.92
pH, Field	su	FLD	NA	DRY	6.37	6.22	6.36	5.81	5.85	6.11	6.45	12.19	DRY	7.23
pH, Lab	su	SM4500-H+B	NA	DRY	7.09	6.88	7.31	6.62	6.74	6.96	7.07	12.2	DRY	8
Potassium	mg/L	EPA 200.7	NA	DRY	1.2	16.2	3.7			2.8			DRY	5.5
Potassium, dissolved	mg/L	EPA 200.7D	NA	DRY	1.2	15.4				3			DRY	5.4
Sodium	mg/L	EPA 200.7	NA	DRY	12.5	1260	179	1250	19.9	10.6	877		DRY	2080
Sodium, dissolved	mg/L	EPA 200.7D	NA	DRY	11.7	1230				11.2			DRY	2050
Specific Conductance, Field	umhos/cm	FLD	NA	DRY	933	6747	1510	9305	1269	1252	3607	8769	DRY	7881
Specific Conductance, Lab	umhos/cm	EPA 120.1	NA	DRY	907	6650	1470	9030	1240	1270	3500	7740	DRY	7810
Sulfate	mg/L	EPA 300.0	250*	DRY	174	61	222	< 10J	19	107	< 10	< 10	DRY	< 10
Alkalinity to pH 4.5	mg/L as CaCO3	SM 18 2320B	NA	DRY	335	892	675			666		1190	DRY	1110
Total dissolved solids	mg/L	SM2540-C	NA	DRY	654	3850	966			780		3700	DRY	4480
Total Organic Carbon	mg/L	SM 18 5310-C	NA	DRY	1.2	28.8	2.2	43.3	3.7	2.6	24.6	29.2	DRY	28.8
Phenolics, total	ug/L	EPA 420.1	4000	DRY	< 20.0	< 20.0		29	< 20.0	< 20.0	< 20.0		DRY	< 20.0
Turbidity	NTU	EPA 180.1	NA	DRY	25.4	124	18.1			6.1		19.1	DRY	9.3
Organics														
Benzene	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	< 5.0	44.4	11	< 5.0	< 5.0	< 5.0	DRY	< 5.0
1,2-Dibromoethane	ug/L	EPA 8260B	0.05	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
1,1-Dichloroethane	ug/L	EPA 8260B	27	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
1,1-Dichloroethene	ug/L	EPA 8260B	7	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
1,2-Dichloroethane	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
cis-1,2-Dichloroethene	ug/L	EPA 8260B	70	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
trans-1,2-Dichloroethene	ug/L	EPA 8260B	100	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Ethylbenzene	ug/L	EPA 8260B	700	DRY	< 5.0	< 5.0	< 5.0	6.2	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0
Methylene Chloride	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Tetrachloroethene	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Toluene	ug/L	EPA 8260B	1000	DRY	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0
1,1,1-Trichloroethane	ug/L	EPA 8260B	200	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Trichloroethene	ug/L	EPA 8260B	5	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Vinyl Chloride	ug/L	EPA 8260B	2	DRY	< 2.0	< 2.0	< 2.0			< 2.0		< 2.0	DRY	< 2.0
Total Xylene	ug/L	EPA 8260B	10000	DRY	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY	< 5.0

MCL = Maximum Contaminant Level (EPA Federal Drinking Water Standards or Pennsylvania DEP Statewide Health Standards for used aquifers in a residential setting where EPA Standard does not exist)
* These values represent secondary MCLs.
Dry Points: MW-201R, MW-310R, SP-4

KELLY RUN SANITATION LANDFILL
PA DEP I.D. NO. 100663

FIRST QUARTER 2010
RESULTS OF CHEMICAL ANALYSES PERFORMED ON GROUNDWATER AND SURFACE WATER

				GROUNDWATER										
Chemical Constituent	**Unit**	**Analytical Method No.**	**MCL**	**MW-201R**	**MW-204**	**MW-211R1**	**MW-301R**	**MW-302R**	**MW-303R**	**MW-304**	**MW-307**	**MW-310**	**MW-310R**	**MW-311**
Annual - Metals														
Arsenic	ug/L	EPA 200.7&8	10	DRY	< 10	< 10	< 10			< 10			DRY	< 10
Arsenic, dissolved	ug/L	EPA 200.7D&8D	10	DRY	< 10	< 10				< 10			DRY	< 10
Barium	mg/L	EPA 200.7	2	DRY	0.14	0.38	0.21			0.14			DRY	7.89
Barium, dissolved	mg/L	EPA 200.7D	2	DRY	0.12	0.28				0.14			DRY	7.68
Cadmium	mg/L	EPA 200.7	0.005	DRY	< 0.005	< 0.005	< 0.005			< 0.005			DRY	< 0.005
Cadmium, dissolved	mg/L	EPA 200.7D	0.005	DRY	< 0.005	< 0.005				< 0.005			DRY	< 0.005
Chromium	mg/L	EPA 200.7	0.1	DRY	< 0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01		DRY	< 0.01
Chromium, dissolved	mg/L	EPA 200.7D	0.1	DRY	< 0.01	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01		DRY	< 0.01
Copper	mg/L	EPA 200.7	1.3	DRY	< 0.01	< 0.01	0.02			< 0.01			DRY	< 0.01
Copper, dissolved	mg/L	EPA 200.7D	1.3	DRY	< 0.01	< 0.01				< 0.01			DRY	< 0.01
Lead	µg/L	EPA 200.8	15	DRY	< 5	< 5	13	< 1.0	< 1.0	< 5	< 1.0		DRY	< 5
Lead, dissolved	µg/L	EPA 200.8D	15	DRY	< 5	< 5		< 1.0	< 1.0	< 5	< 1.0		DRY	< 5
Mercury	µg/L	SM 3112B	2	DRY	< 0.20	< 0.20	< 0.20			< 0.20			DRY	< 0.20
Mercury, dissolved	µg/L	SM 3112B (D)	2	DRY	< 0.20	< 0.20				< 0.20			DRY	< 0.20
Selenium	µg/L	EPA 200.8	50	DRY	6	< 5	< 5			< 5			DRY	< 5
Selenium, dissolved	µg/L	EPA 200.8D	50	DRY	7	< 5				< 5			DRY	5
Silver	mg/L	EPA 200.7	0.1*	DRY	< 0.01	< 0.01	< 0.01			< 0.01			DRY	< 0.01
Silver, dissolved	mg/L	EPA 200.7D	0.1*	DRY	< 0.01	< 0.01				< 0.01			DRY	< 0.01
Zinc	mg/L	EPA 200.7	5*	DRY	< 0.01	< 0.01	0.07			< 0.01			DRY	< 0.01
Zinc, dissolved	mg/L	EPA 200.7D	5*	DRY	< 0.01	< 0.01				< 0.01			DRY	< 0.01
Annual - Organics														
Tribromomethane	µg/L	EPA 8260B	100	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Bromomethane	µg/L	EPA 8260B	10	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Carbon Tetrachloride	µg/L	EPA 8260B	5	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Chlorobenzene	µg/L	EPA 8260B	100	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Chloroethane	µg/L	EPA 8260B	230	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Chlorodibromomethane	µg/L	EPA 8260B	100	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Chloromethane	µg/L	EPA 8260B	3	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
3-Chloro-1-Propene	µg/L	EPA 8260B	NA	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
1,2-Dichlorobenzene	µg/L	EPA 8260B	600	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
1,3-Dichlorobenzene	µg/L	EPA 8260B	600	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
1,4-Dichlorobenzene	µg/L	EPA 8260B	NA	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Dichlorodifluoromethane	µg/L	EPA 8260B	1000	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
1,2-Dichloropropane	µg/L	EPA 8260B	5	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
cis-1,3-Dichloropropene	µg/L	EPA 8260B	6.6	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
trans-1,3-Dichloropropene	µg/L	EPA 8260B	6.6	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Methyl Ethyl Ketone	µg/L	EPA 8260B	2800	DRY	< 5.0	< 5.0	< 5.0			< 5.0		10.4	DRY	< 5.0
4-Methyl-2-Pentanone	µg/L	EPA 8260B	190	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
1,1,1,2-Tetrachloroethane	µg/L	EPA 8260B	70	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
1,1,2,2-Tetrachloroethane	µg/L	EPA 8260B	0.3	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
1,1,2-Trichloroethane	µg/L	EPA 8260B	5	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Trichlorofluoromethane	µg/L	EPA 8260B	2000	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
1,2,3-Trichloropropane	µg/L	EPA 8260B	40	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0

MCL = Maximum Contaminant Level (EPA Federal Drinking Water Standards or Pennsylvania DEP Statewide Health Standards for used aquifers in a residential setting where EPA Standard does not exist)
* These values represent secondary MCLs.
Dry Points: MW-201R, MW-310R, SP-4

TABLE 3

KELLY RUN SANITATION LANDFILL
PA DEP I.D. NO. 100663

FIRST QUARTER 2010
RESULTS OF CHEMICAL ANALYSES PERFORMED ON GROUNDWATER AND SURFACE WATER

				GROUNDWATER										
Chemical Constituent	Unit	Analytical Method No.	MCL	MW-201R	MW-204	MW-211R1	MW-301R	MW-302R	MW-303R	MW-304	MW-307	MW-310	MW-310R	MW-311
Annual Organics & Metals (Add-On List)														
Acetone	ug/L	EPA 8260B	3,700	DRY	25	< 20.0	< 20.0			< 20.0		74.4	DRY	< 20.0
Acrylonitrile	ug/L	EPA 8260B	0.630	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Bromochloromethane	ug/L	EPA 8260B	90	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Dichlorobromomethane	ug/L	EPA 8260B	100	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Carbon Disulfide	ug/L	EPA 8260B	1,900	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Trichloromethane	ug/L	EPA 8260B	100	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
1,2-Dibromo-3-chloropropane	ug/L	EPA 8260B	0.200	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
trans-1,4-Dichloro-2-butene	ug/L	EPA 8260B	0.016	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
2-Hexanone	ug/L	EPA 8260B	NA	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Dibromomethane	ug/L	EPA 8260B	97	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Iodomethane	ug/L	EPA 8260B	NA	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Styrene	ug/L	EPA 8260B	100	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Vinyl Acetate	ug/L	EPA 8260B	550	DRY	< 5.0	< 5.0	< 5.0			< 5.0		< 5.0	DRY	< 5.0
Antimony	ug/L	EPA 200.8	6	DRY	< 6	< 6	< 6			< 6			DRY	< 6
Beryllium	mg/L	EPA 200.7	0.004	DRY	< 0.004	< 0.004	< 0.004			< 0.004			DRY	< 0.004
Cobalt	mg/L	EPA 200.7	0.730	DRY	< 0.01	< 0.01	< 0.01			< 0.01			DRY	< 0.01
Nickel	mg/L	EPA 200.7	0.100	DRY	< 0.02	0.02	0.02			< 0.02			DRY	< 0.02
Thallium	ug/L	EPA 200.8	2	DRY	< 2	< 2	< 2			< 2			DRY	< 2
Vanadium	mg/L	EPA 200.7	0.260	DRY	< 0.01	< 0.01	< 0.01			< 0.01			DRY	< 0.01

MCL = Maximum Contaminant Level (EPA Federal Drinking Water Standards or Pennsylvania DEP Statewide Health Standards for used aquifers in a residential setting where EPA Standard does not exist)
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Dry Points: MW-201R, MW-310R, SP-4

TABLE 3

KELLY RUN SANITATION LANDFILL
PA DEP I.D. NO. 100663

FIRST QUARTER 2010
RESULTS OF CHEMICAL ANALYSES PERFORMED ON GROUNDWATER AND SURFACE WATER

				GROUNDWATER									
Chemical Constituent	**Unit**	**Analytical Method No.**	**MCL**	**MW-312**	**MW-P1U**	**MW-P1D1**	**MW-P1D2**	**MW-P2U**	**MW-P2D1**	**MW-P2D2**	**MWPZ-1**	**MWPZ-2**	**MWPZ-3**
Inorganics													
Ammonia Nitrogen	mg/L as N	EPA 350.1&D	NA	22.4	0.62	0.4	0.11	< 0.10	< 0.10	< 0.10			
Bicarbonate	mg/L as CaCO3	SM 4500-CO2D	NA	1000	505	500	477	< 5	220	191			
Calcium	mg/L	EPA 200.7	NA	182	174	171	157	225	97.7	134			
Calcium, dissolved	mg/L	EPA 200.7D	NA	190	152	170	138	205	96.1	138			
Chemical Oxygen Demand	mg/L	HACH 8000	NA	270	< 10	12	14	< 10	< 10	< 10			
Chloride	mg/L	EPA 300.0	250*	1860	67	77	91	36	71	42	136	157	177
Fluoride	mg/L	EPA 300.0	4	< 0.1	0.1	0.1	< 0.1	0.2	0.1	0.1			
Iron	mg/L	EPA 200.7	0.3*	1.68	0.37	1.41	0.07	0.57	< 0.05	< 0.05	1.23	2.73	4.89
Iron, dissolved	mg/L	EPA 200.7D	0.3*	1.85	< 0.05	1.03	< 0.05	0.28	< 0.05	< 0.05	1.01	0.18	5.24
Magnesium	mg/L	EPA 200.7	NA	102	51.8	47.2	40.3	81	37	47.7			
Magnesium, dissolved	mg/L	EPA 200.7D	NA	106	51.6	47.7	41.1	73.6	36.5	46.8			
Manganese	mg/L	EPA 200.7	0.05*	0.05	3.33	0.27	1.02	1.45	< 0.01	< 0.01	0.03	0.04	0.04
Manganese, dissolved	mg/L	EPA 200.7D	0.05*	0.05	2.95	0.25	0.9	1.1	< 0.01	< 0.01	0.03	< 0.01	0.04
Nitrate Nitrogen	mg/L as N	EPA 300.0	10	0.83	< 0.05	< 0.05	< 0.05	0.43	0.62	0.57			
pH, Field	su	FLD	NA	6.17	6.26	6.61	6.27	3.2	6.14	6.12	7.18	7.22	6.39
pH, Lab	su	SM4500-H+B	NA	7.04	7.5	7.61	7.35	4.36	7.1	6.91	7.85	7.87	7.16
Potassium	mg/L	EPA 200.7	NA	18	3.9	2.7	2.6	2	3	3.8			
Potassium, dissolved	mg/L	EPA 200.7D	NA	19	3.8	2.7	2.4	2	2.9	4			
Sodium	mg/L	EPA 200.7	NA	1280	111	93.8	122	30.3	33.5	29.2	801	863	720
Sodium, dissolved	mg/L	EPA 200.7D	NA	1280	115	94.5	114	28.5	33.5	29.9			
Specific Conductance, Field	umhos/cm	FLD	NA	6202	1360	1294	1302	1680	815.3	974.4	2740	2932	2763
Specific Conductance, Lab	umhos/cm	EPA 120.1	NA	6670	1320	1250	1270	1540	814	955	2660	2900	2670
Sulfate	mg/L	EPA 300.0	250*	< 10	171	126	104	968	106	274	< 10	< 10	< 10
Alkalinity to pH 4.5	mg/L as CaCO3	SM 18 2320B	NA	1010	507	502	478	< 5	220	191			
Total dissolved solids	mg/L	SM2540-C	NA	3830	860	802	798	1560	508	692			
Total Organic Carbon	mg/L	SM 18 5310-C	NA	61.5	2.2	2	3.3	1.2	1.6	1.2	6.5	8	10.8
Phenolics, total	ug/L	EPA 420.1	4000	31	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0
Turbidity	NTU	EPA 180.1	NA	20.1	9.2	30.2	0.5	1.1	0.3	0.4			
Organics													
Benzene	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dibromoethane	ug/L	EPA 8260B	0.05	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
1,1-Dichloroethane	ug/L	EPA 8260B	27	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
1,1-Dichloroethene	ug/L	EPA 8260B	7	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
1,2-Dichloroethane	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
cis-1,2-Dichloroethene	ug/L	EPA 8260B	70	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
trans-1,2-Dichloroethene	ug/L	EPA 8260B	100	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
Ethylbenzene	ug/L	EPA 8260B	700	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Methylene Chloride	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
Tetrachloroethene	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
Toluene	ug/L	EPA 8260B	1000	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1,1-Trichloroethane	ug/L	EPA 8260B	200	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
Trichloroethene	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
Vinyl Chloride	ug/L	EPA 8260B	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
Total Xylene	ug/L	EPA 8260B	10000	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

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* These values represent secondary MCLs.
Dry Points: MW-201R, MW-310R, SP-4

TABLE 3

KELLY RUN SANITATION LANDFILL
PA DEP I.D. NO. 100663

FIRST QUARTER 2010
RESULTS OF CHEMICAL ANALYSES PERFORMED ON GROUNDWATER AND SURFACE WATER

				GROUNDWATER									
Chemical Constituent	**Unit**	**Analytical Method No.**	**MCL**	**MW-312**	**MW-P1U**	**MW-P1D1**	**MW-P1D2**	**MW-P2U**	**MW-P2D1**	**MW-P2D2**	**MWPZ-1**	**MWPZ-2**	**MWPZ-3**
Annual - Metals													
Arsenic	mg/L	EPA 200.7&8	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10			
Arsenic, dissolved	mg/L	EPA 200.7D&8D	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10			
Barium	mg/L	EPA 200.7	2	19.9	0.11	0.06	0.06	0.01	0.02	0.02			
Barium, dissolved	mg/L	EPA 200.7D	2	19.8	0.07	0.06	0.05	0.01	0.02	0.02			
Cadmium	mg/L	EPA 200.7&.8	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005			
Cadmium, dissolved	mg/L	EPA 200.7D&.8D	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005			
Chromium	mg/L	EPA 200.7	0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
Chromium, dissolved	mg/L	EPA 200.7D	0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
Copper	mg/L	EPA 200.7	1.3	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01			
Copper, dissolved	mg/L	EPA 200.7D	1.3	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01			
Lead	µg/L	EPA 200.8	15	< 5	< 5	< 5	< 5	< 5	< 5	< 5			
Lead, dissolved	µg/L	EPA 200.8D	15	< 5	< 5	< 5	< 5	< 5	< 5	< 5			
Mercury	µg/L	SM 3112B	2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20			
Mercury, dissolved	µg/L	SM 3112B (D)	2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20			
Selenium	µg/L	EPA 200.8	50	15	< 5	< 5	< 5	< 5	< 5	6			
Selenium, dissolved	µg/L	EPA 200.8D	50	11	< 5	< 5	< 5	< 5	< 5	6			
Silver	mg/L	EPA 200.7	0.1*	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
Silver, dissolved	mg/L	EPA 200.7D	0.1*	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
Zinc	mg/L	EPA 200.7	5*	< 0.01	< 0.01	< 0.01	< 0.01	0.43	0.03	< 0.01			
Zinc, dissolved	mg/L	EPA 200.7D	5*	0.01	< 0.01	< 0.01	< 0.01	0.33	0.03	< 0.01			
Annual - Organics													
Tribromomethane	µg/L	EPA 8260B	100	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
Bromomethane	µg/L	EPA 8260B	10	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
Carbon Tetrachloride	µg/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
Chlorobenzene	µg/L	EPA 8260B	100	8	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
Chloroethane	µg/L	EPA 8260B	230	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
Chlorodibromomethane	µg/L	EPA 8260B	100	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
Chloromethane	µg/L	EPA 8260B	3	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
3-Chloro-1-Propene	µg/L	EPA 8260B	NA	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
1,2-Dichlorobenzene	µg/L	EPA 8260B	600	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
1,3-Dichlorobenzene	µg/L	EPA 8260B	600	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
1,4-Dichlorobenzene	µg/L	EPA 8260B	NA	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
Dichlorodifluoromethane	µg/L	EPA 8260B	1000	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
1,2-Dichloropropane	µg/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
cis-1,3-Dichloropropene	µg/L	EPA 8260B	6.6	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
trans-1,3-Dichloropropene	µg/L	EPA 8260B	6.6	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
Methyl Ethyl Ketone	µg/L	EPA 8260B	2800	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
4-Methyl-2-Pentanone	µg/L	EPA 8260B	190	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
1,1,1,2-Tetrachloroethane	µg/L	EPA 8260B	70	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
1,1,2,2-Tetrachloroethane	µg/L	EPA 8260B	0.3	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
1,1,2-Trichloroethane	µg/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
Trichlorofluoromethane	µg/L	EPA 8260B	2000	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
1,2,3-Trichloropropane	µg/L	EPA 8260B	40	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			

MCL = Maximum Contaminant Level (EPA Federal Drinking Water Standards or Pennsylvania DEP Statewide Health Standards for used aquifers in a residential setting where EPA Standard does not exist)
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TABLE 3

KELLY RUN SANITATION LANDFILL
PA DEP I.D. NO. 100663

FIRST QUARTER 2010
RESULTS OF CHEMICAL ANALYSES PERFORMED ON GROUNDWATER AND SURFACE WATER

				GROUNDWATER									
Chemical Constituent	Unit	Analytical Method No.	MCL	MW-312	MW-P1U	MW-P1D1	MW-P1D2	MW-P2U	MW-P2D1	MW-P2D2	MWPZ-1	MWPZ-2	MWPZ-3
Annual Organics & Metals (Add-On List)													
Acetone	ug/L	EPA 8260B	3,700	44.9	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0			
Acrylonitrile	ug/L	EPA 8260B	0.630	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
Bromochloromethane	ug/L	EPA 8260B	90	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
Dichlorobromomethane	ug/L	EPA 8260B	100	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
Carbon Disulfide	ug/L	EPA 8260B	1,900	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
Trichloromethane	ug/L	EPA 8260B	100	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
1,2-Dibromo-3-chloropropane	ug/L	EPA 8260B	0.200	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
trans-1,4-Dichloro-2-butene	ug/L	EPA 8260B	0.016	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
2-Hexanone	ug/L	EPA 8260B	NA	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
Dibromomethane	ug/L	EPA 8260B	97	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
Iodomethane	ug/L	EPA 8260B	NA	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
Styrene	ug/L	EPA 8260B	100	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
Vinyl Acetate	ug/L	EPA 8260B	550	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
Antimony	ug/L	EPA 200.8	6	< 6	< 6	< 6	< 6	< 6	< 6	< 6			
Beryllium	mg/L	EPA 200.7	0.004	< 0.004	< 0.004	< 0.004	< 0.004	0.011	< 0.004	< 0.004			
Cobalt	mg/L	EPA 200.7	0.730	< 0.01	< 0.01	< 0.01	< 0.01	0.1	< 0.01	< 0.01			
Nickel	mg/L	EPA 200.7	0.100	< 0.02	< 0.02	< 0.02	< 0.02	0.33	< 0.02	< 0.02			
Thallium	ug/L	EPA 200.8	2	< 2	< 2	< 2	< 2	< 2	< 2	< 2			
Vanadium	mg/L	EPA 200.7	0.260	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			

MCL = Maximum Contaminant Level (EPA Federal Drinking Water Standards or Pennsylvania DEP Statewide Health Standards for used aquifers in a residential setting where EPA Standard does not exist)
* These values represent secondary MCLs.
Dry Points: MW-201R, MW-310R, SP-4

TABLE 3

KELLY RUN SANITATION LANDFILL
PA DEP I.D. NO. 100663

FIRST QUARTER 2010
RESULTS OF CHEMICAL ANALYSES PERFORMED ON GROUNDWATER AND SURFACE WATER

Chemical Constituent	Unit	Analytical Method No.	MCL	SURFACE WATER KR-2	FTR-2	ST-2	ST-3	ST-5	SP-3	SP-4
Inorganics										
Ammonia Nitrogen	mg/L as N	EPA 350.1&D	NA	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	DRY
Bicarbonate	mg/L as CaCO3	SM 4500-CO2D	NA	161	172	154	147	103	350	DRY
Calcium	mg/L	EPA 200.7	NA	70.5	75.7	74.9	73.7	53.8	122	DRY
Calcium, dissolved	mg/L	EPA 200.7D	NA	69.5	72.3	65.4	70.6	52	124	DRY
Chemical Oxygen Demand	mg/L	HACH 8000	NA	11	25	49	24	14	< 10	DRY
Chloride	mg/L	EPA 300.0	250*	38	99	69	55	71	20	DRY
Fluoride	mg/L	EPA 300.0	4	0.1	0.2	< 0.1	< 0.1	< 0.1	< 0.1	DRY
Iron	mg/L	EPA 200.7	0.3*	0.23	2.79	6.21	2.66	4.04	0.12	DRY
Iron, dissolved	mg/L	EPA 200.7D	0.3*	< 0.05	< 0.05	< 0.05	< 0.05	0.05	< 0.05	DRY
Magnesium	mg/L	EPA 200.7	NA	21.9	22.8	19.1	27.2	15.4	69.7	DRY
Magnesium, dissolved	mg/L	EPA 200.7D	NA	21.8	22.2	17.5	26.2	14.7	70.6	DRY
Manganese	mg/L	EPA 200.7	0.05*	0.01	0.15	0.42	0.1	0.17	0.04	DRY
Manganese, dissolved	mg/L	EPA 200.7D	0.05*	< 0.01	0.03	0.02	< 0.01	< 0.01	< 0.01	DRY
Nitrate Nitrogen	mg/L as N	EPA 300.0	10	0.53	1.29	1.66	1.28	1.27	3.35	DRY
pH, Field	su	FLD	NA	6.15	7.51	7.42	7.15	7.1	6.36	DRY
pH, Lab	su	SM4500-H+B	NA	8.39	8.22	8.26	8.27	7.97	7.63	DRY
Potassium	mg/L	EPA 200.7	NA	2.5	3.4	5.2	2.5	2.5	2.7	DRY
Potassium, dissolved	mg/L	EPA 200.7D	NA	2.4	3.2	4.5	2.2	2.2	2.7	DRY
Sodium	mg/L	EPA 200.7	NA	23.5	60.2	40.6	34.6	38.1	15.2	DRY
Sodium, dissolved	mg/L	EPA 200.7D	NA	23.3	59.6	39.4	34.3	37	15.4	DRY
Specific Conductance, Field	umhos/cm	FLD	NA	540	757	602	651	526	995.8	DRY
Specific Conductance, Lab	umhos/cm	EPA 120.1	NA	560	767	603	649	533	987	DRY
Sulfate	mg/L	EPA 300.0	250*	59	84	50	93	51	172	DRY
Alkalinity to pH 4.5	mg/L as CaCO3	SM 18 2320B	NA	185	175	157	150	104	351	DRY
Total dissolved solids	mg/L	SM2540-C	NA	316	426	350	398	304	646	DRY
Total Organic Carbon	mg/L	SM 18 5310-C	NA	3.5	3.3	3.9	2.2	3	1.1	DRY
Phenolics, total	ug/L	EPA 420.1	4000	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0	DRY
Turbidity	NTU	EPA 180.1	NA	7.4	20.7	149	66.8	109	1.3	DRY
Organics										
Benzene	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,2-Dibromoethane	ug/L	EPA 8260B	0.05	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,1-Dichloroethane	ug/L	EPA 8260B	27	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,1-Dichloroethene	ug/L	EPA 8260B	7	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,2-Dichloroethane	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
cis-1,2-Dichloroethene	ug/L	EPA 8260B	70	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
trans-1,2-Dichloroethene	ug/L	EPA 8260B	100	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Ethylbenzene	ug/L	EPA 8260B	700	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Methylene Chloride	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Tetrachloroethene	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Toluene	ug/L	EPA 8260B	1000	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,1,1-Trichloroethane	ug/L	EPA 8260B	200	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Trichloroethene	ug/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Vinyl Chloride	ug/L	EPA 8260B	2	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	DRY
Total Xylene	ug/L	EPA 8260B	10000	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY

MCL = Maximum Contaminant Level (EPA Federal Drinking Water Standards or Pennsylvania DEP Statewide Health Standards for used aquifers in a residential setting where EPA Standard does not exist)
* These values represent secondary MCLs.
Dry Points: MW-201R, MW-310R, SP-4

TABLE 3

KELLY RUN SANITATION LANDFILL
PA DEP I.D. NO. 100663

FIRST QUARTER 2010
RESULTS OF CHEMICAL ANALYSES PERFORMED ON GROUNDWATER AND SURFACE WATER

				SURFACE WATER						
Chemical Constituent	**Unit**	**Analytical Method No.**	**MCL**	**KR-2**	**FTR-2**	**ST-2**	**ST-3**	**ST-5**	**SP-3**	**SP-4**
Annual - Metals										
Arsenic	mg/L	EPA 200.7&8	10	< 10	< 10	< 10	< 10	< 10	< 10	DRY
Arsenic, dissolved	mg/L	EPA 200.7D&8D	10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	DRY
Barium	mg/L	EPA 200.7	2	0.05	0.08	0.14	0.09	0.09	0.08	DRY
Barium, dissolved	mg/L	EPA 200.7D	2	0.05	0.06	0.07	0.07	0.06	0.14	DRY
Cadmium	mg/L	EPA 200.7&.8	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	DRY
Cadmium, dissolved	mg/L	EPA 200.7D&.8D	0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	DRY
Chromium	mg/L	EPA 200.7	0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	DRY
Chromium, dissolved	mg/L	EPA 200.7D	0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	DRY
Copper	mg/L	EPA 200.7	1.3	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	DRY
Copper, dissolved	mg/L	EPA 200.7D	1.3	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	DRY
Lead	µg/L	EPA 200.8	15	< 5	< 5	10	< 5	< 5	< 5	DRY
Lead, dissolved	µg/L	EPA 200.8D	15	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Mercury	µg/L	SM 3112B	2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	DRY
Mercury, dissolved	µg/L	SM 3112B (D)	2	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	DRY
Selenium	µg/L	EPA 200.8	50	< 5	< 5	< 5	< 5	< 5	10	DRY
Selenium, dissolved	µg/L	EPA 200.8D	50	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	10.4	DRY
Silver	mg/L	EPA 200.7	0.1*	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	DRY
Silver, dissolved	mg/L	EPA 200.7D	0.1*	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	DRY
Zinc	mg/L	EPA 200.7	5*	< 0.01	0.02	0.05	0.01	0.02	< 0.01	DRY
Zinc, dissolved	mg/L	EPA 200.7D	5*	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	DRY
Annual - Organics										
Tribromomethane	µg/L	EPA 8260B	100	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Bromomethane	µg/L	EPA 8260B	10	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Carbon Tetrachloride	µg/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Chlorobenzene	µg/L	EPA 8260B	100	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Chloroethane	µg/L	EPA 8260B	230	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Chlorodibromomethane	µg/L	EPA 8260B	100	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Chloromethane	µg/L	EPA 8260B	3	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
3-Chloro-1-Propene	µg/L	EPA 8260B	NA	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,2-Dichlorobenzene	µg/L	EPA 8260B	600	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,3-Dichlorobenzene	µg/L	EPA 8260B	600	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,4-Dichlorobenzene	µg/L	EPA 8260B	NA	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Dichlorodifluoromethane	µg/L	EPA 8260B	1000	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,2-Dichloropropane	µg/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
cis-1,3-Dichloropropene	µg/L	EPA 8260B	6.6	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
trans-1,3-Dichloropropene	µg/L	EPA 8260B	6.6	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Methyl Ethyl Ketone	µg/L	EPA 8260B	2800	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
4-Methyl-2-Pentanone	µg/L	EPA 8260B	190	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,1,1,2-Tetrachloroethane	µg/L	EPA 8260B	70	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,1,2,2-Tetrachloroethane	µg/L	EPA 8260B	0.3	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,1,2-Trichloroethane	µg/L	EPA 8260B	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Trichlorofluoromethane	µg/L	EPA 8260B	2000	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,2,3-Trichloropropane	µg/L	EPA 8260B	40	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY

MCL = Maximum Contaminant Level (EPA Federal Drinking Water Standards or Pennsylvania DEP Statewide Health Standards for used aquifers in a residential setting where EPA Standard does not exist)
* These values represent secondary MCLs.
Dry Points: MW-201R, MW-310R, SP-4

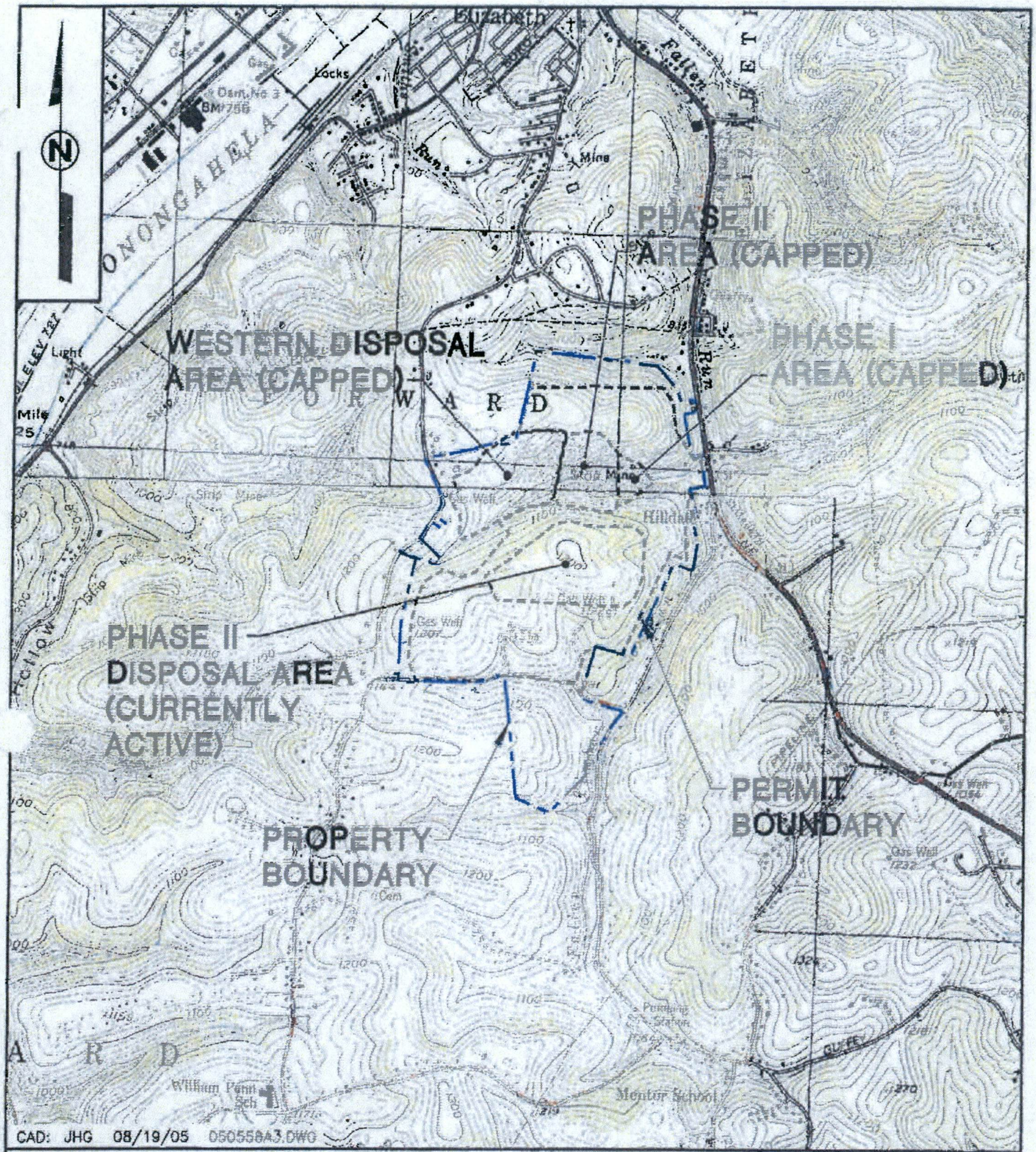
TABLE 3

KELLY RUN SANITATION LANDFILL
PA DEP I.D. NO. 100663

FIRST QUARTER 2010
RESULTS OF CHEMICAL ANALYSES PERFORMED ON GROUNDWATER AND SURFACE WATER

Chemical Constituent	Unit	Analytical Method No.	MCL	SURFACE WATER						
				KR-2	FTR-2	ST-2	ST-3	ST-5	SP-3	SP-4
Annual Organics & Metals (Add-On List)										
Acetone	ug/L	EPA 8260B	3,700	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0	< 20.0	DRY
Acrylonitrile	ug/L	EPA 8260B	0.630	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Bromochloromethane	ug/L	EPA 8260B	90	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Dichlorobromomethane	ug/L	EPA 8260B	100	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Carbon Disulfide	ug/L	EPA 8260B	1,900	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Trichloromethane	ug/L	EPA 8260B	100	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
1,2-Dibromo-3-chloropropane	ug/L	EPA 8260B	0.200	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
trans-1,4-Dichloro-2-butene	ug/L	EPA 8260B	0.016	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
2-Hexanone	ug/L	EPA 8260B	NA	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Dibromomethane	ug/L	EPA 8260B	97	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Iodomethane	ug/L	EPA 8260B	NA	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Styrene	ug/L	EPA 8260B	100	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Vinyl Acetate	ug/L	EPA 8260B	550	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	DRY
Antimony	ug/L	EPA 200.8	6	< 6	< 6	< 6	< 6	< 6	< 6	DRY
Beryllium	mg/L	EPA 200.7	0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	DRY
Cobalt	mg/L	EPA 200.7	0.730	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	DRY
Nickel	mg/L	EPA 200.7	0.100	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	DRY
Thallium	ug/L	EPA 200.8	2	< 2	< 2	< 2	< 2	< 2	< 2	DRY
Vanadium	mg/L	EPA 200.7	0.260	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	DRY

MCL = Maximum Contaminant Level (EPA Federal Drinking Water Standards or Pennsylvania DEP Statewide Health Standards for used aquifers in a residential setting where EPA Standard does not exist)
* These values represent secondary MCLs.
Dry Points: MW-201R, MW-310R, SP-4



REFERENCE
U.S.G.S. 7.5 MINUTE TOPOGRAPHIC
QUADRANGLE MAPS OF GLASSPORT,
MCKESSPORT, MONOGAHELA AND DONORA, PA

SCALE

2000 0 2000 FT.

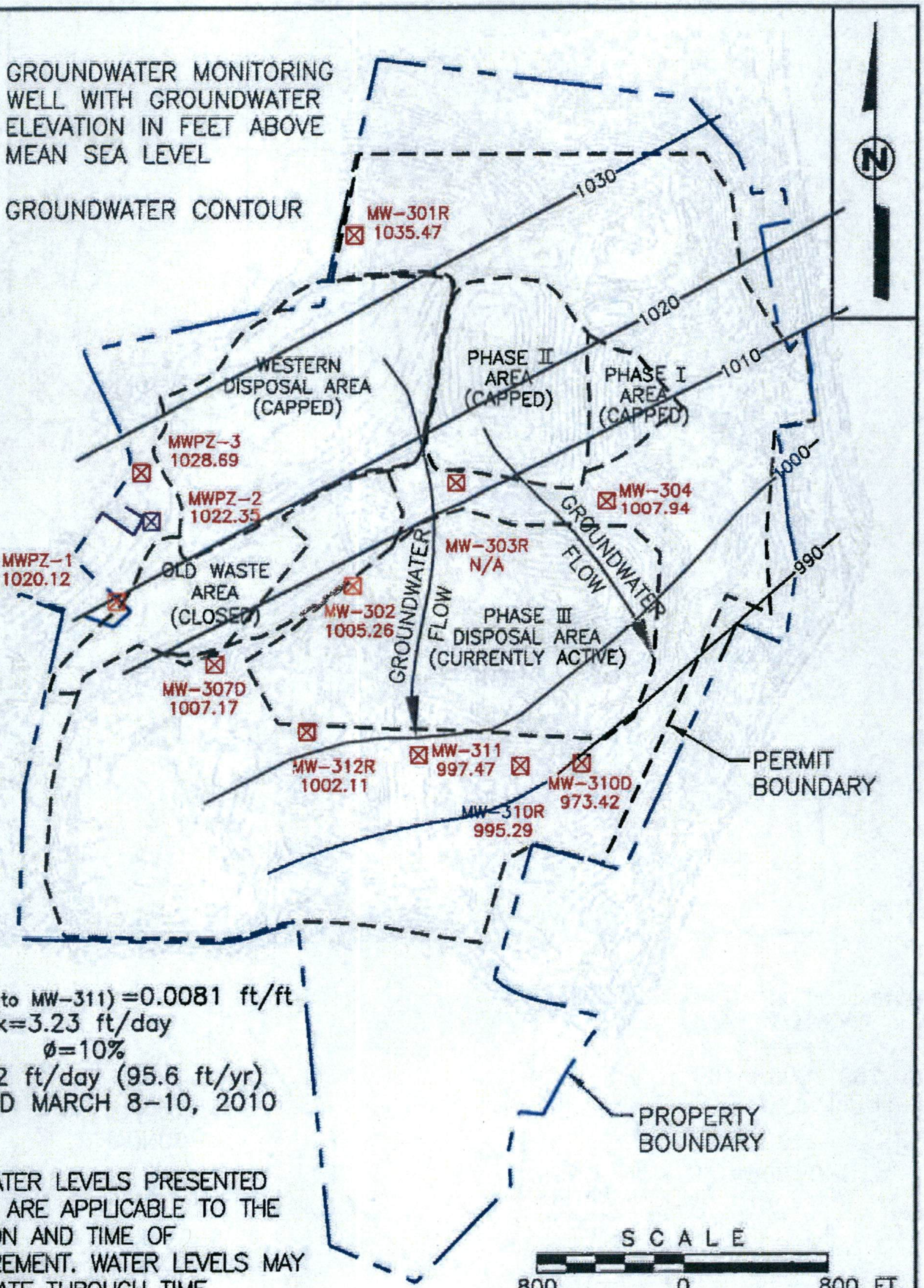
CEC Civil & Environmental Consultants, Inc. EXPORT, PA PITTSBURGH, PA (724) 327-5200 • (412) 429-2324 Cincinnati, OH • Columbus, OH • Indianapolis, IN • Nashville, TN	U.S.G.S. SITE LOCATION MAP KELLY RUN LANDFILL PERMIT NO. 100663

DWN. BY: JHG	SCALE:	DATE:	PROJECT NO.:	
CHKD. BY: RCD	AS SHOWN	08/19/05	050558	FIGURE NO. 1

LEGEND

GROUNDWATER MONITORING WELL WITH GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL (MW-304 1007.94)

1020 GROUNDWATER CONTOUR



i (MW-302 to MW-311) =0.0081 ft/ft
k=3.23 ft/day
ø=10%
V=0.262 ft/day (95.6 ft/yr)
MEASURED MARCH 8-10, 2010

NOTE:

1. THE WATER LEVELS PRESENTED HEREIN ARE APPLICABLE TO THE LOCATION AND TIME OF MEASUREMENT. WATER LEVELS MAY FLUCTUATE THROUGH TIME.

CEC
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EXPORT, PA PITTSBURGH, PA
(724) 327-5200 • (412) 429-2324
Cincinnati, OH • Columbus, OH • Indianapolis, IN • Nashville, TN

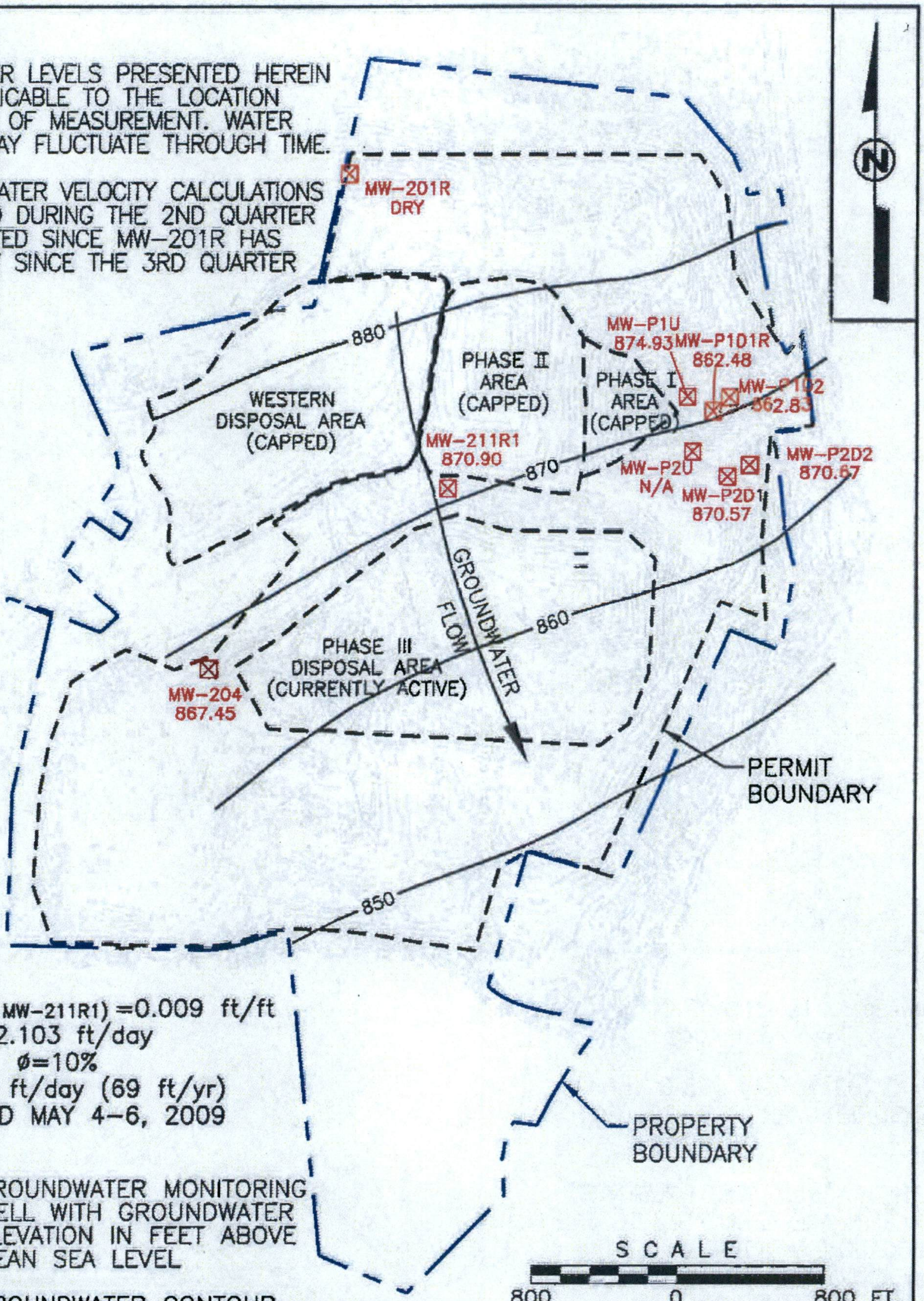
BENWOOD LIMESTONE POTENTIOMETRIC MAP
KELLY RUN LANDFILL
PERMIT NO. 100663

DWN. BY: JHG	SCALE:	DATE:	PROJECT NO.:	
CHKD. BY: RSF	AS SHOWN	05/04/10	050-558.0110	FIGURE NO. 2

G:\PROJECT\5\050558\DWG\050558A45.DWG (JGILLIGAN) - MAY 24, 2010 - 16:3_

NOTE:

1. THE WATER LEVELS PRESENTED HEREIN ARE APPLICABLE TO THE LOCATION AND TIME OF MEASUREMENT. WATER LEVELS MAY FLUCTUATE THROUGH TIME.
2. GROUNDWATER VELOCITY CALCULATIONS MEASURED DURING THE 2ND QUARTER 2009 LISTED SINCE MW-201R HAS BEEN DRY SINCE THE 3RD QUARTER 2009.



i(MW-201R to MW-211R1) =0.009 ft/ft
k=2.103 ft/day
ø=10%
V=0.189 ft/day (69 ft/yr)
MEASURED MAY 4-6, 2009

LEGEND

MW-P2D1 870.57 — GROUNDWATER MONITORING WELL WITH GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL

—870— GROUNDWATER CONTOUR

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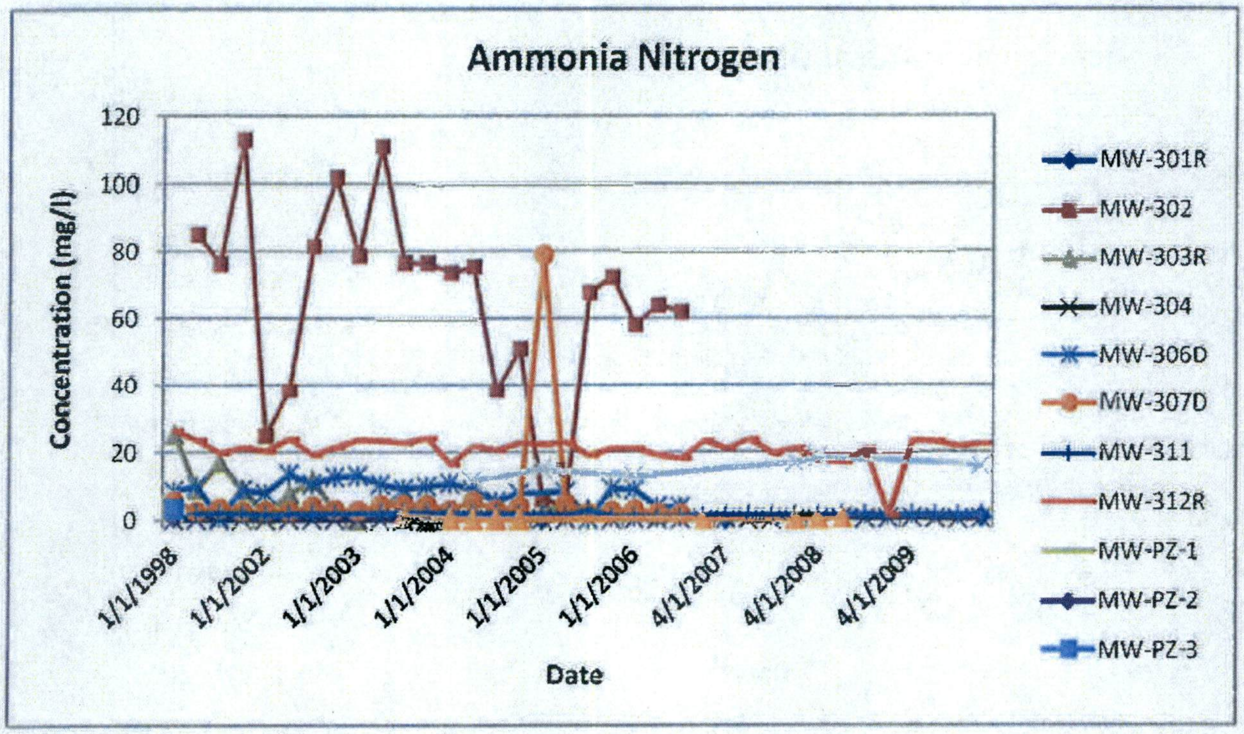
PITTSBURGH COAL
POTENTIOMETRIC MAP
KELLY RUN LANDFILL
PERMIT NO. 100663

DWN. BY: JHG	SCALE:	DATE:	PROJECT NO.:	
CHKD. BY: RSF	AS SHOWN	05/04/10	050-558.0110	FIGURE NO. 3

G:\PROJECT...5\050558\DWG\050558A46.DWG (JGILLIGAN) – MAY 24, 2010 – 16:15

FIGURE 4

KELLY RUN SANITATION, INC
BENWOOD LIMESTONE
TIME SERIES PLOTS



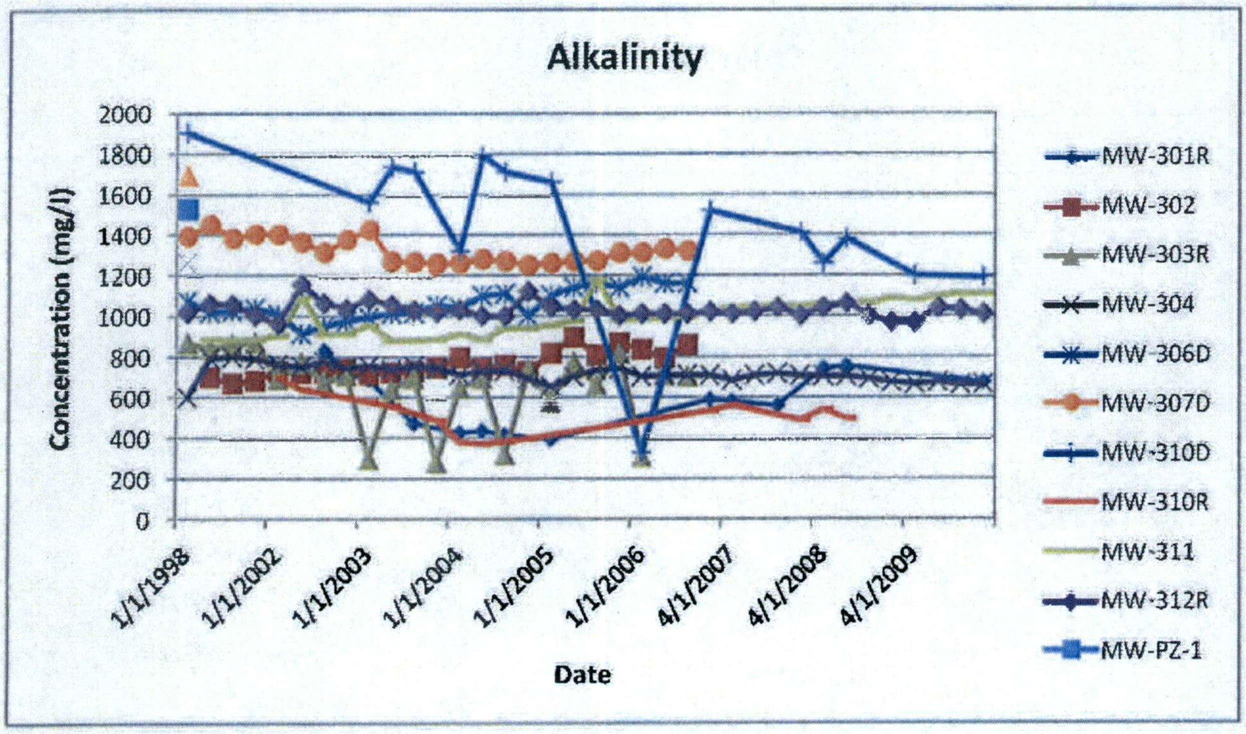
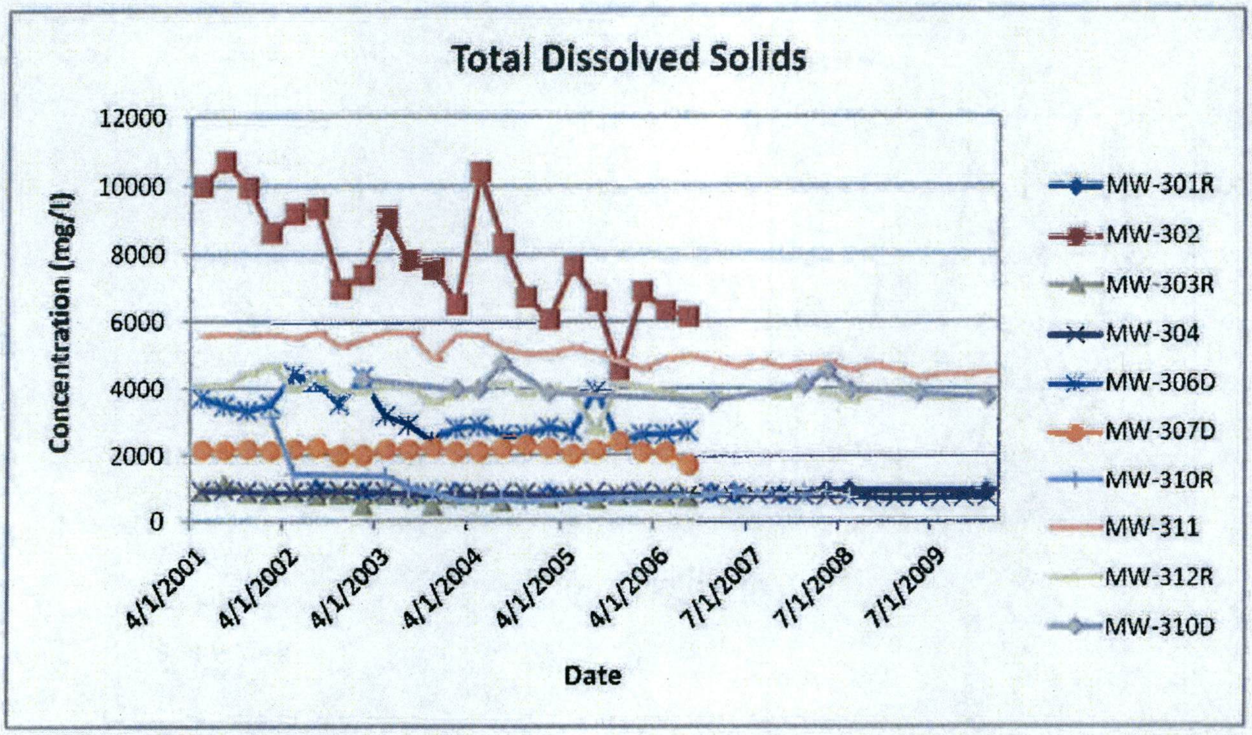


FIGURE 4

KELLY RUN SANITATION, INC
BENWOOD LIMESTONE
TIME SERIES PLOTS



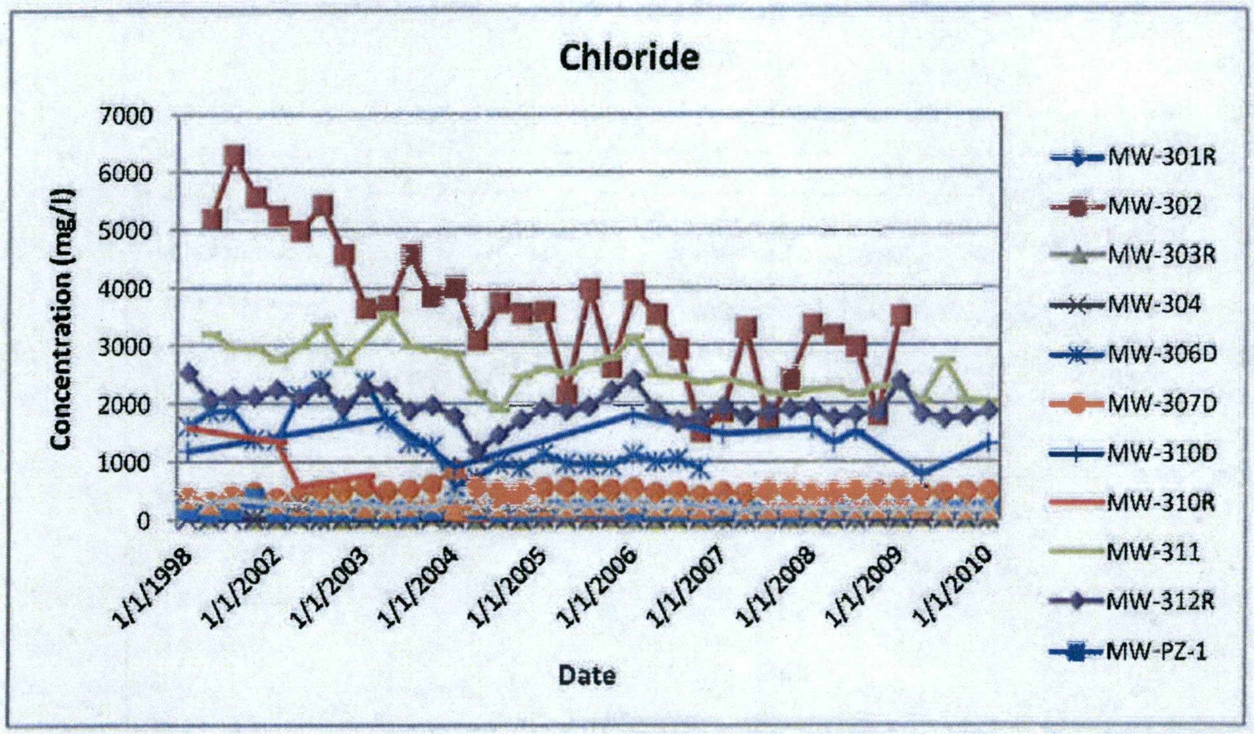


FIGURE 4

KELLY RUN SANITATION, INC
BENWOOD LIMESTONE
TIME SERIES PLOTS

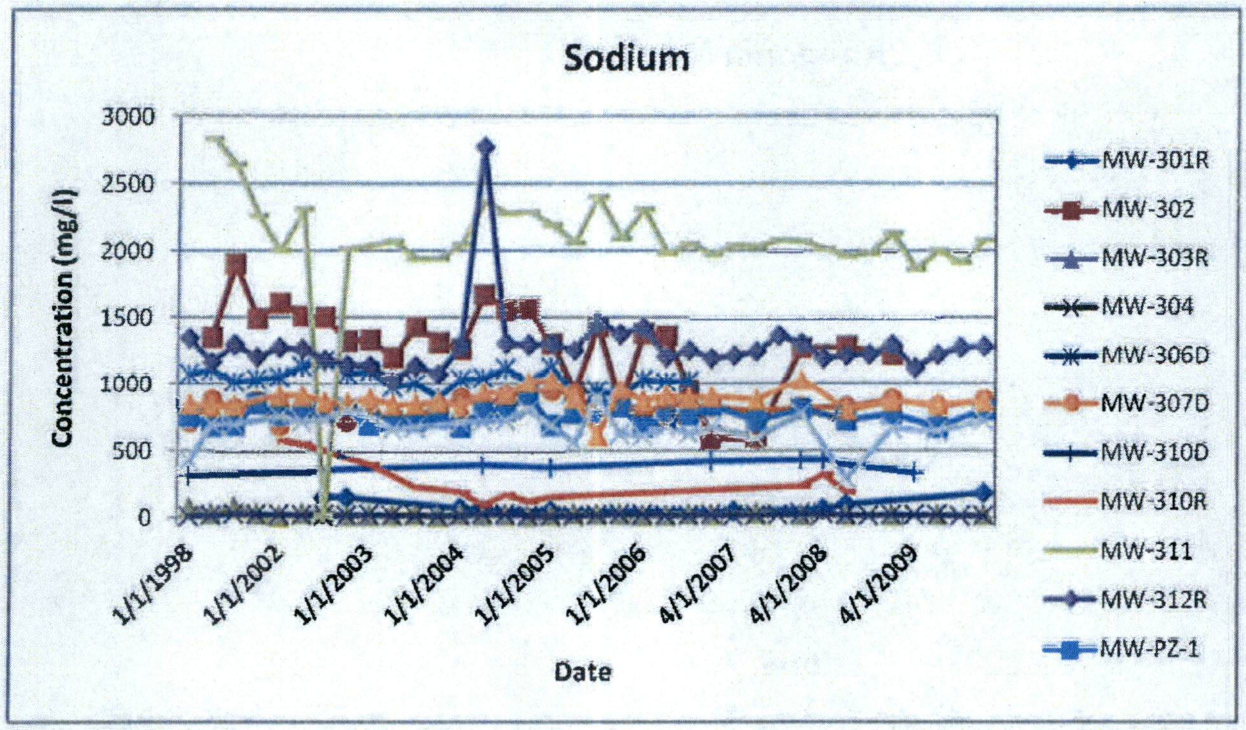
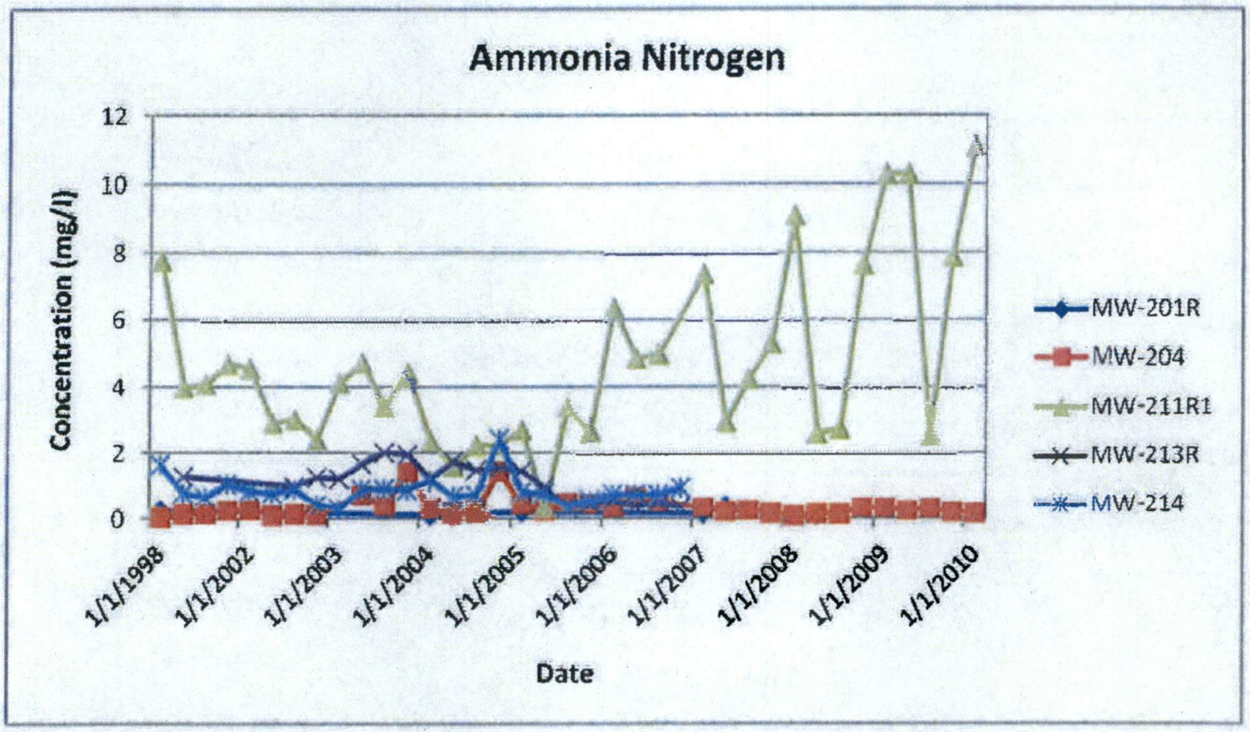


FIGURE 5

KELLY RUN SANITATION, INC
PITTSBURGH COAL
TIME SERIES PLOTS



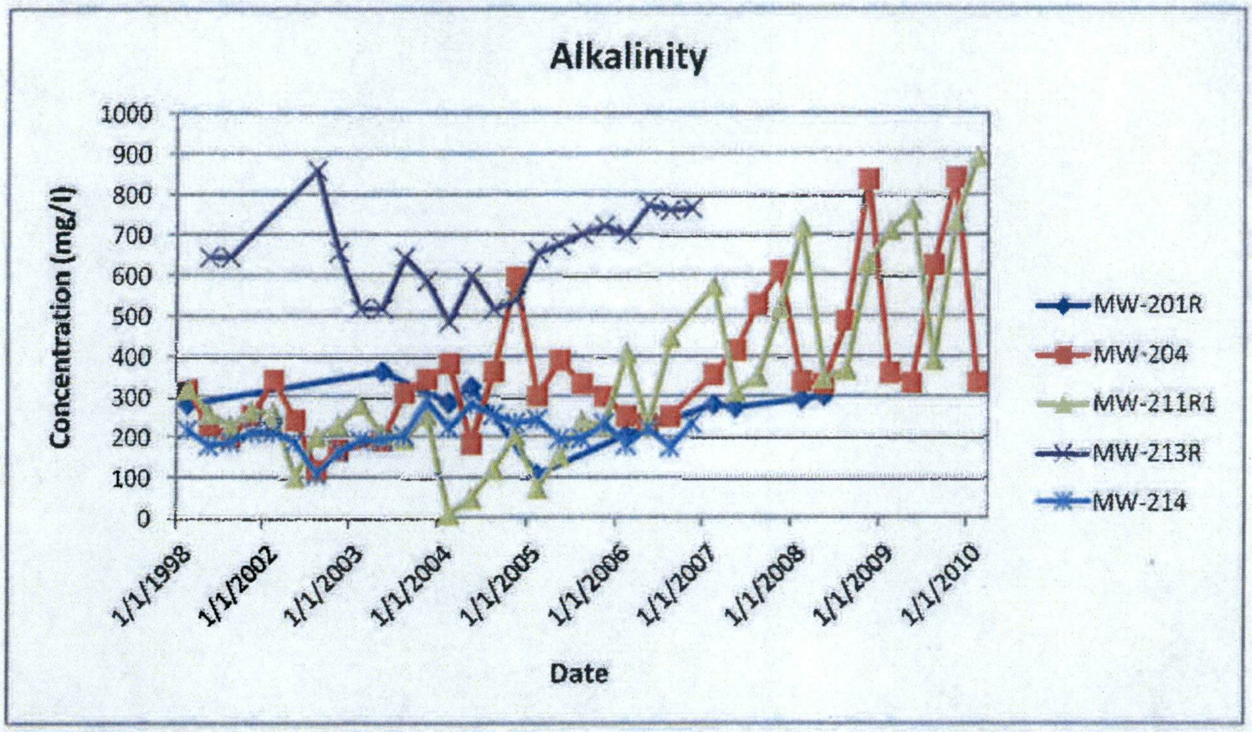
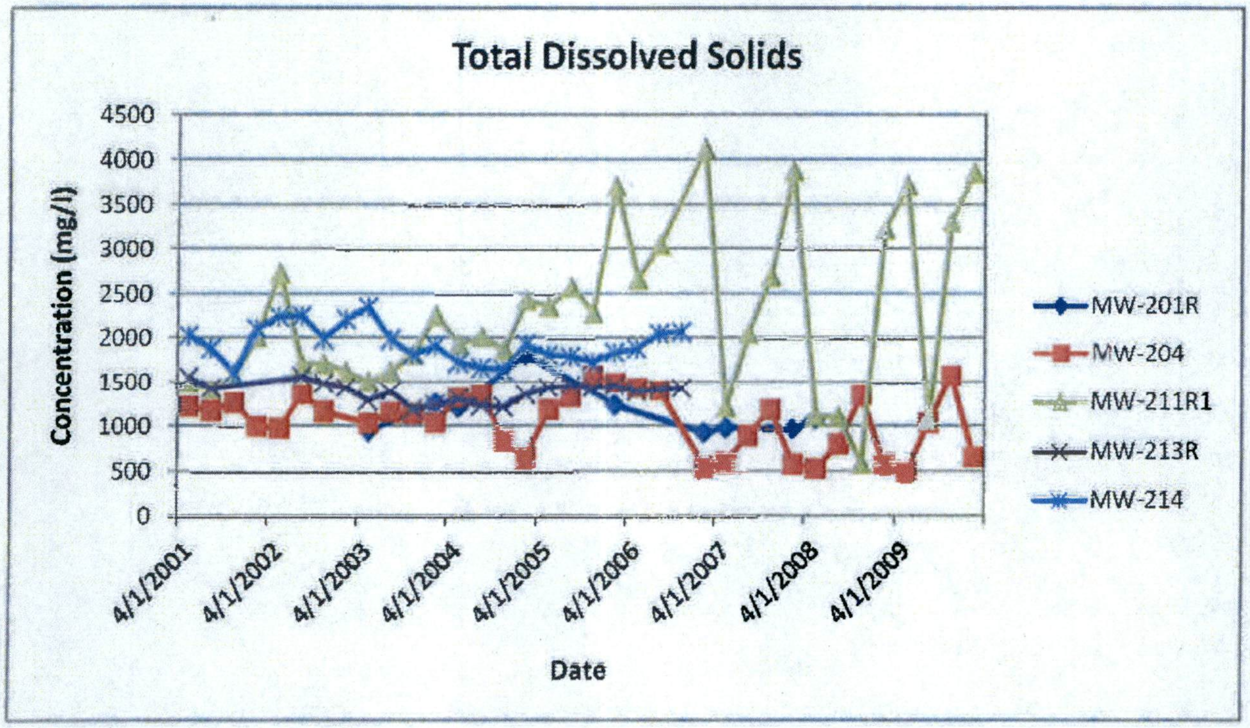


FIGURE 5

KELLY RUN SANITATION, INC
PITTSBURGH COAL
TIME SERIES PLOTS



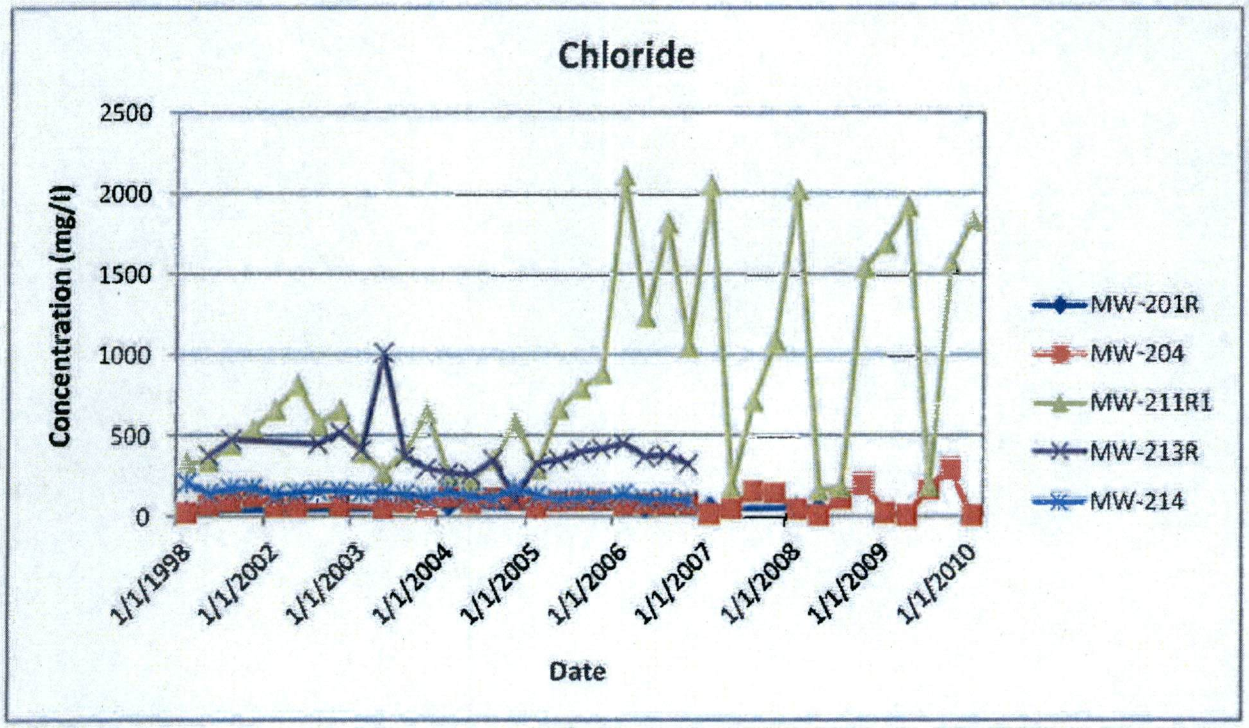


FIGURE 5

KELLY RUN SANITATION, INC
PITTSBURGH COAL
TIME SERIES PLOTS

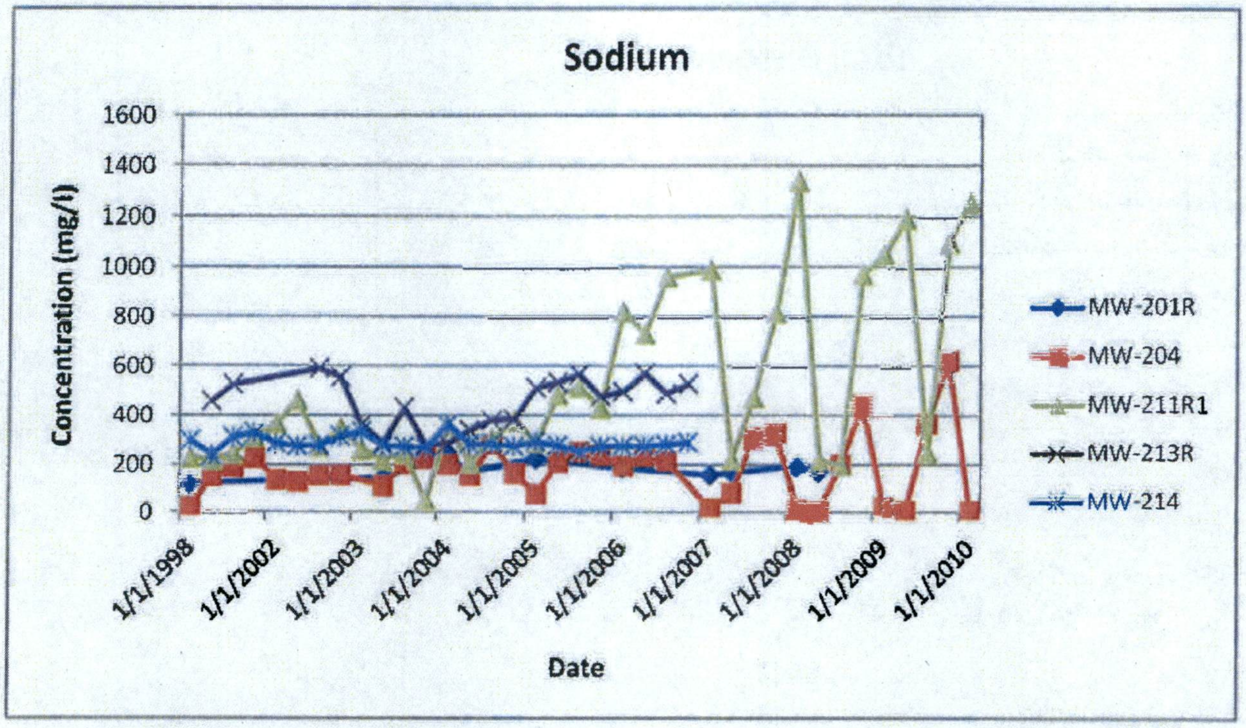
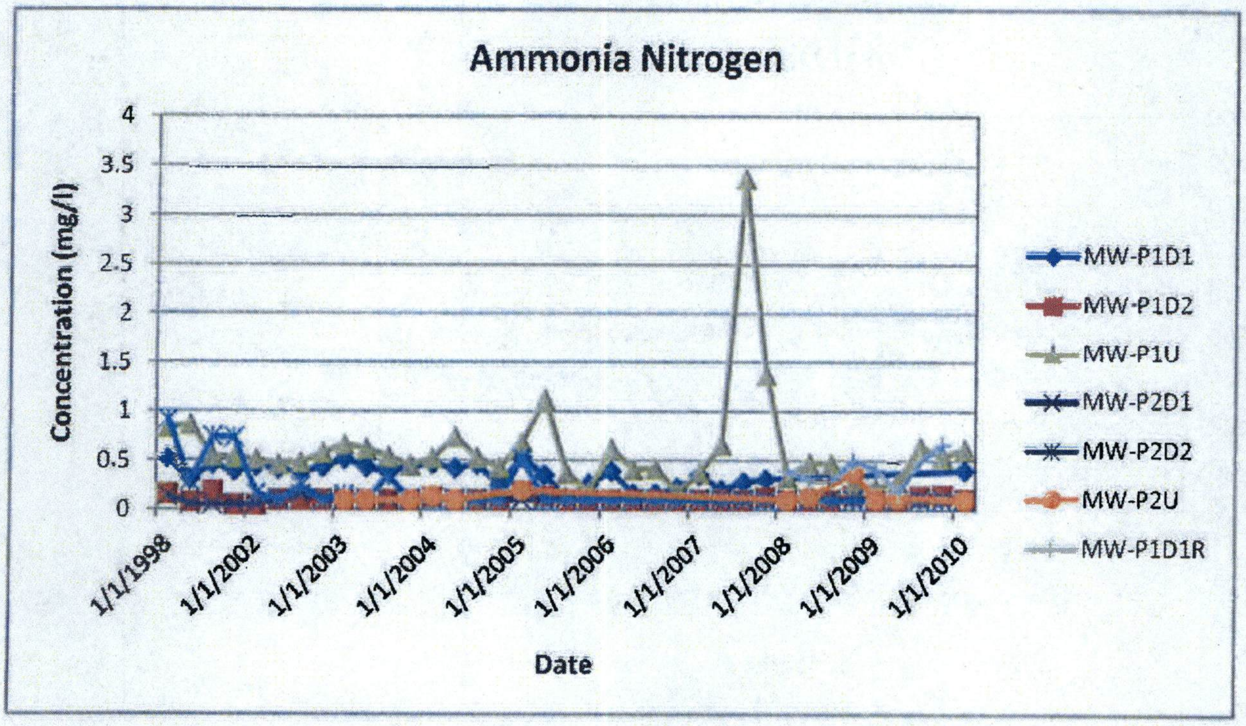


FIGURE 6

KELLY RUN SANITATION, INC
LEACHATE POND
TIME SERIES PLOTS



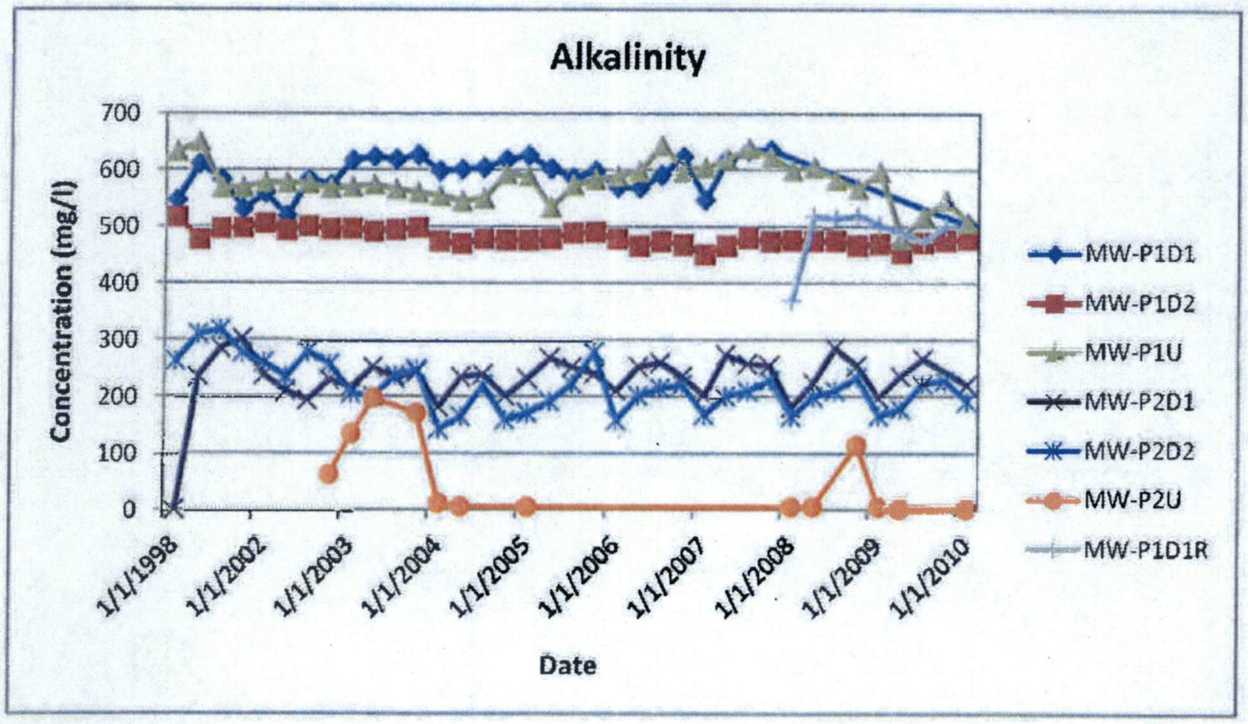
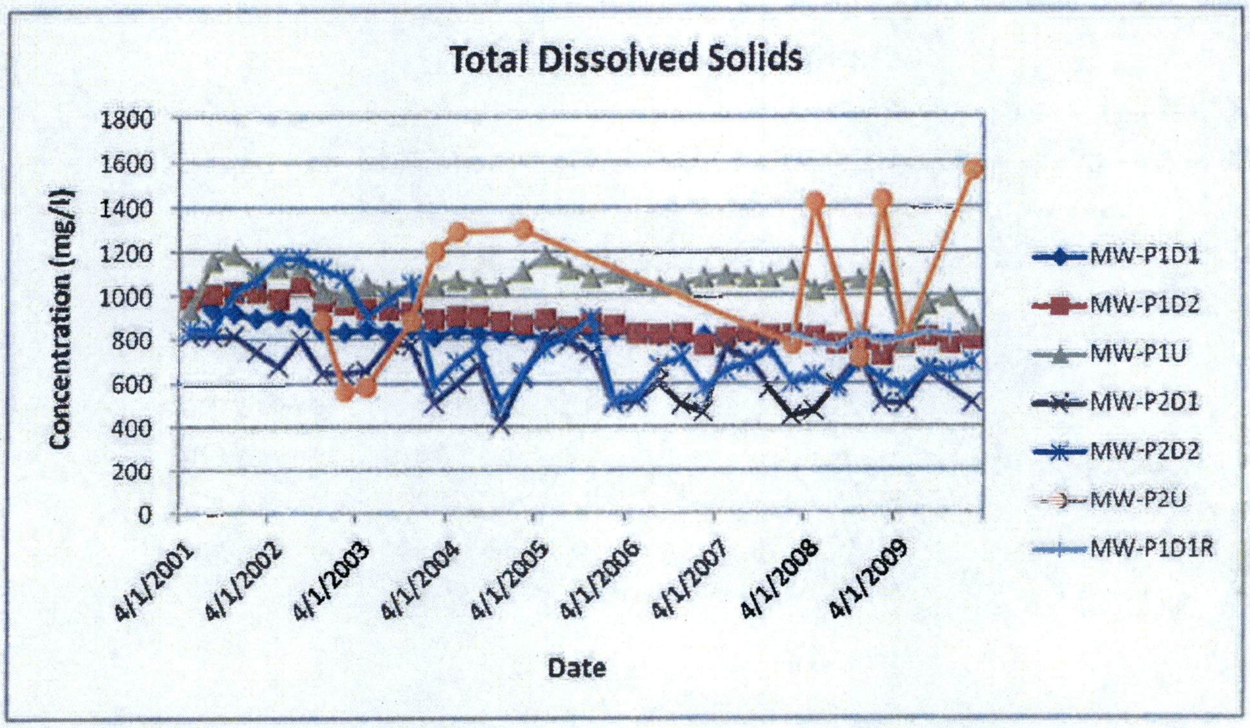


FIGURE 6

KELLY RUN SANITATION, INC
LEACHATE POND
TIME SERIES PLOTS



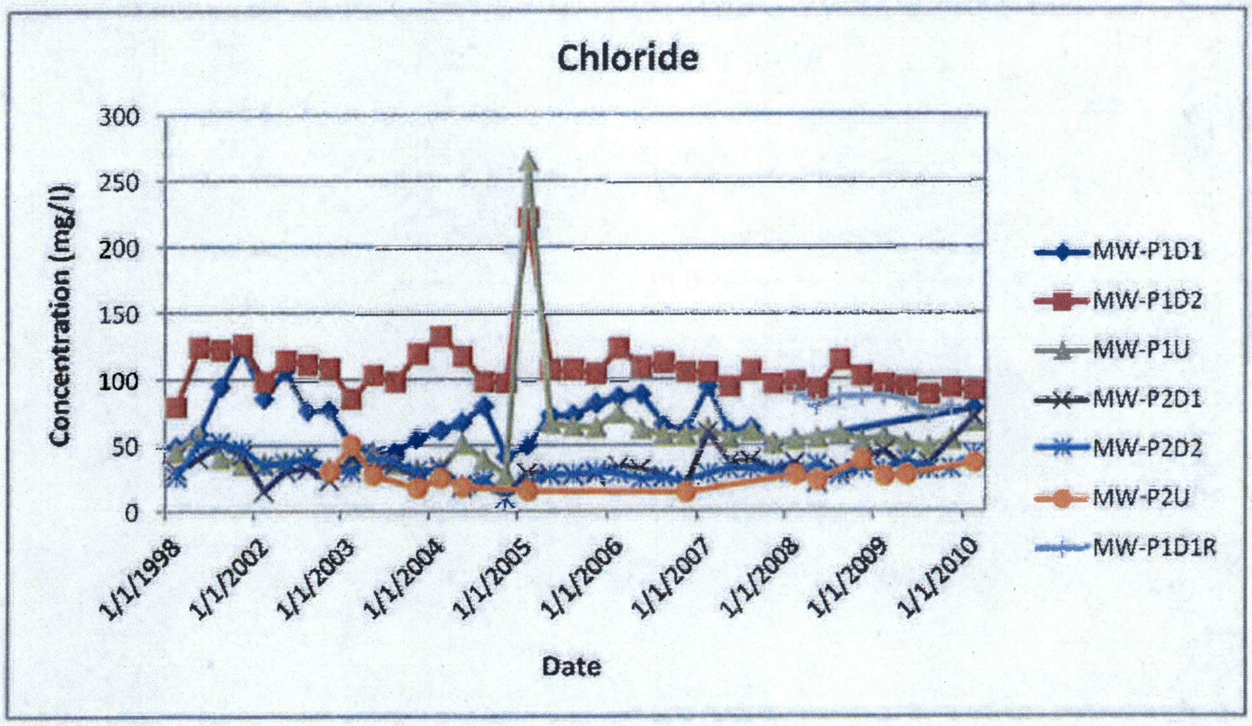


FIGURE 6

KELLY RUN SANITATION, INC
LEACHATE POND
TIME SERIES PLOTS

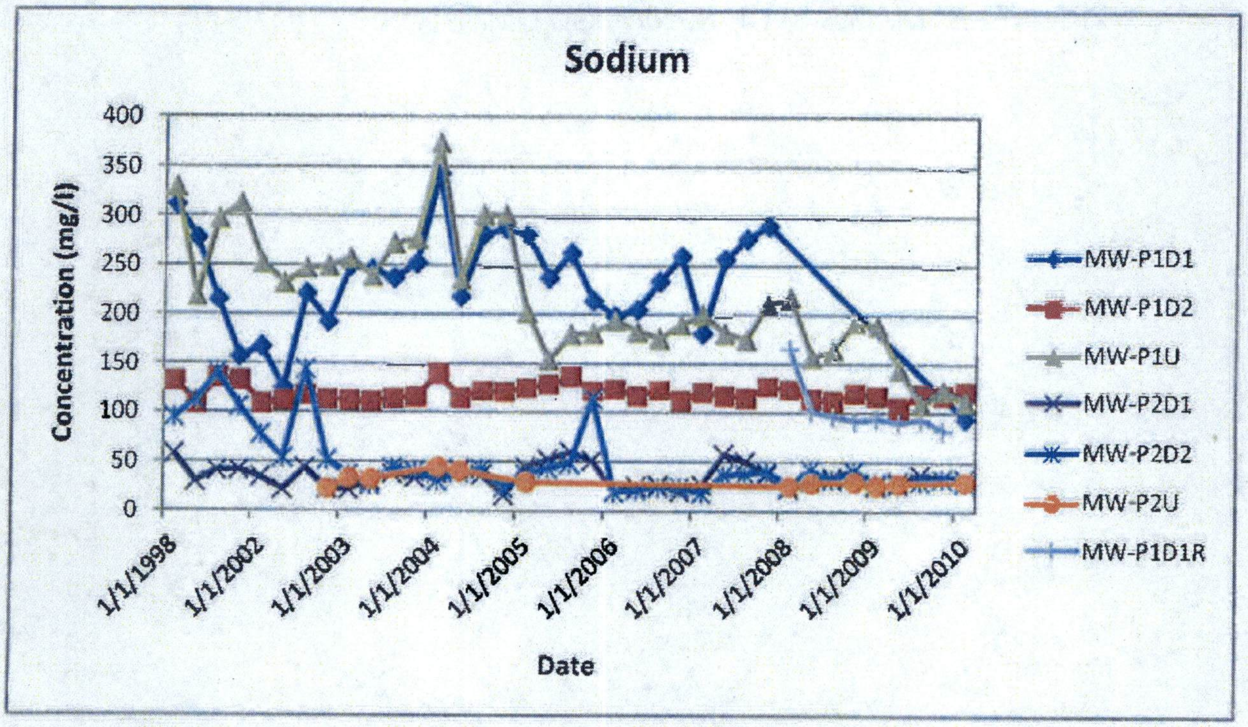


FIGURE 7

TRILINEAR DIAGRAM OF BENWOOD LIMESTONE

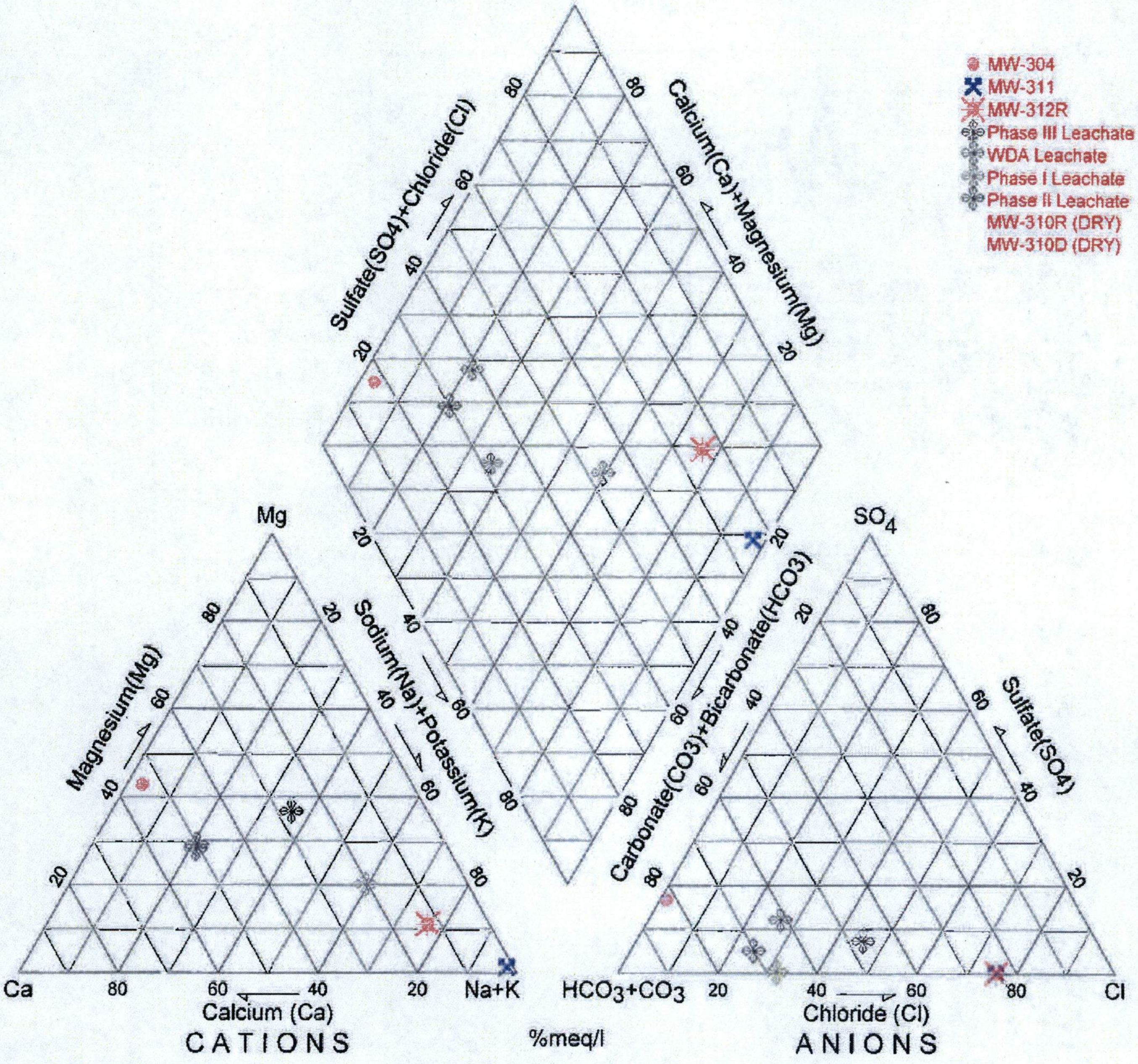


FIGURE 8
STIFF DIAGRAM OF BENWOOD LIMESTONE

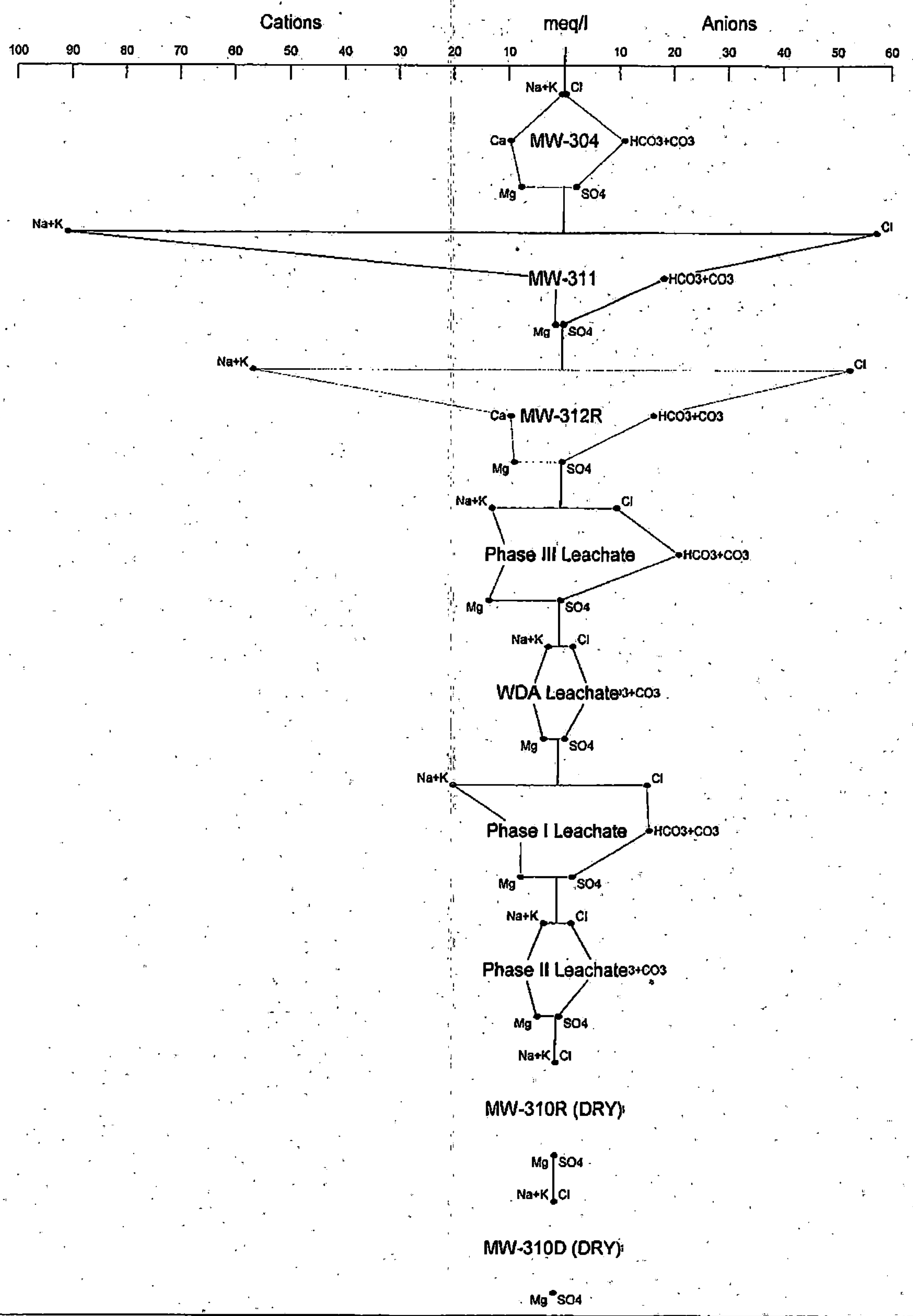


FIGURE 9

TRILINEAR DIAGRAM OF PITTSBURGH COAL

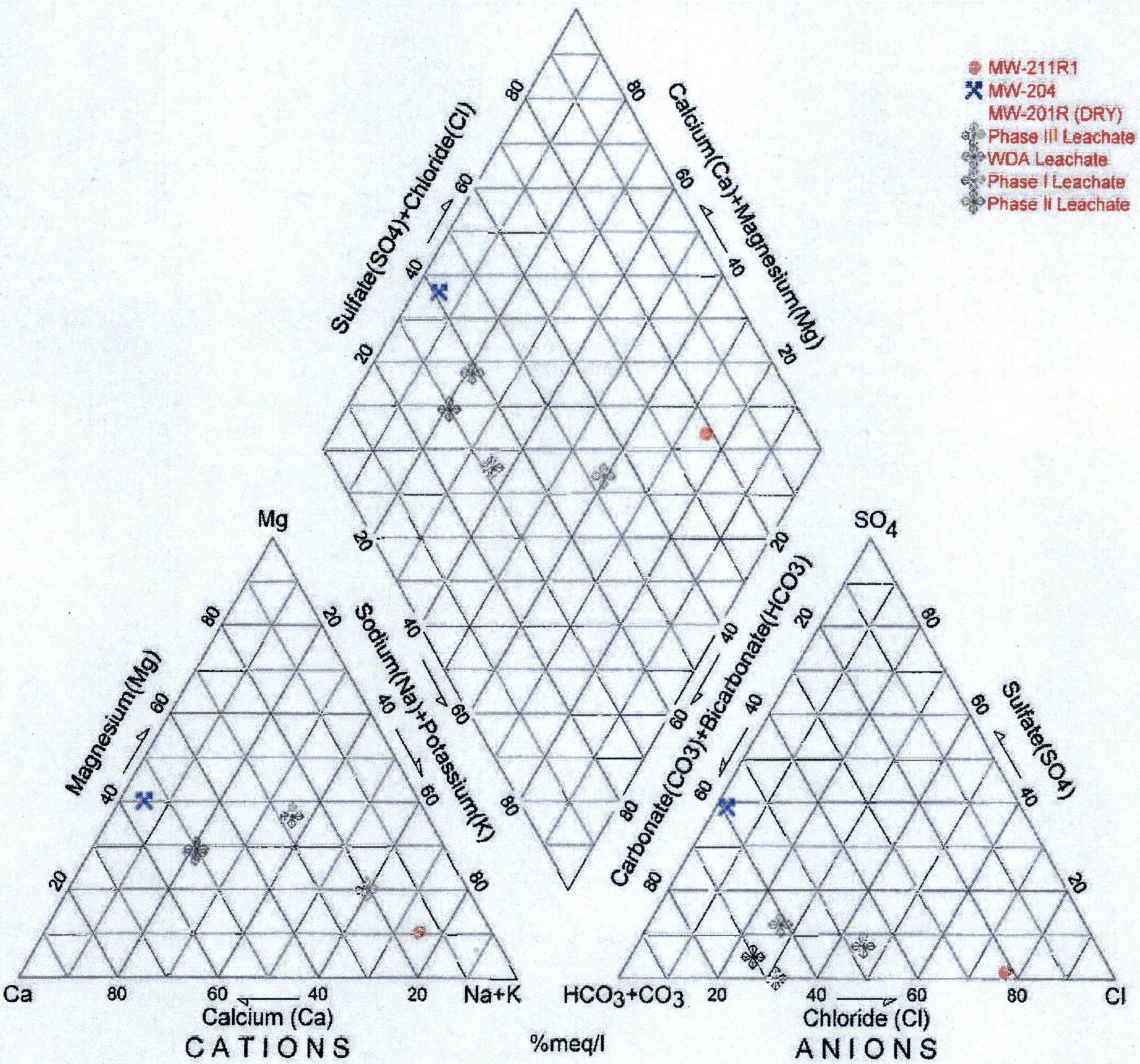


FIGURE 10
STIFF DIAGRAM OF PITTSBURGH COAL

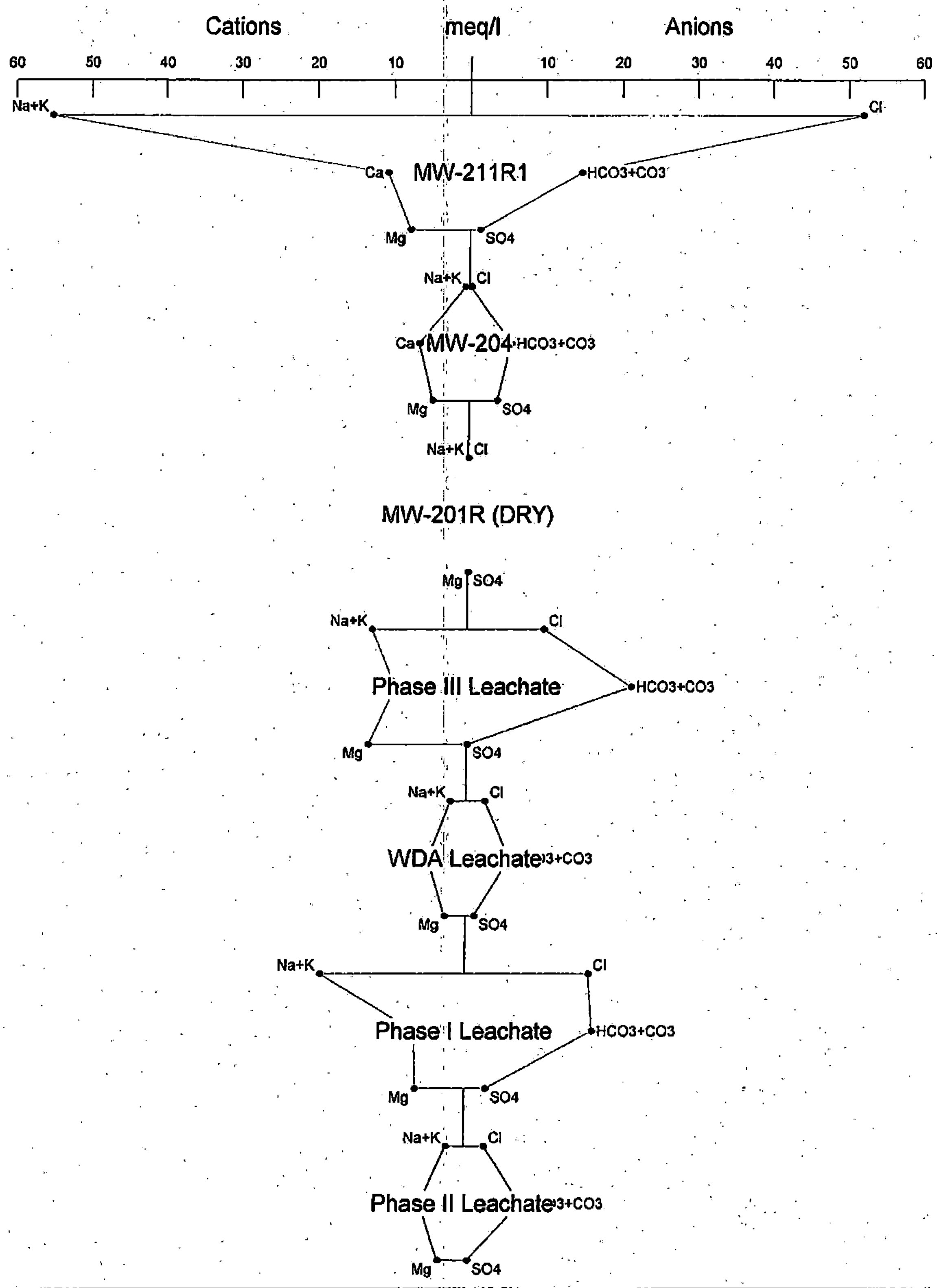


FIGURE 11

TRILINEAR DIAGRAM OF LEACHATE POND NETWORK

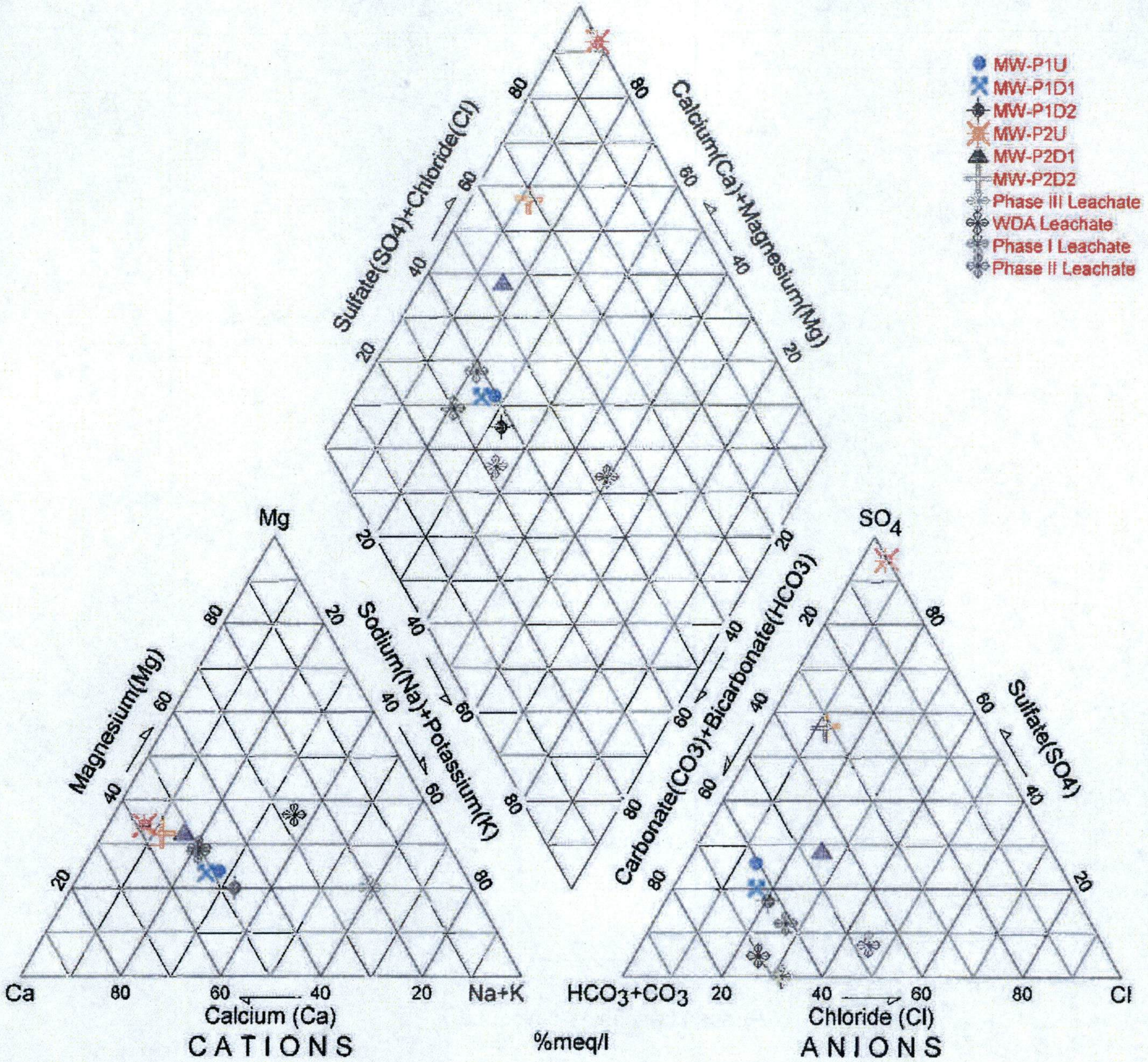
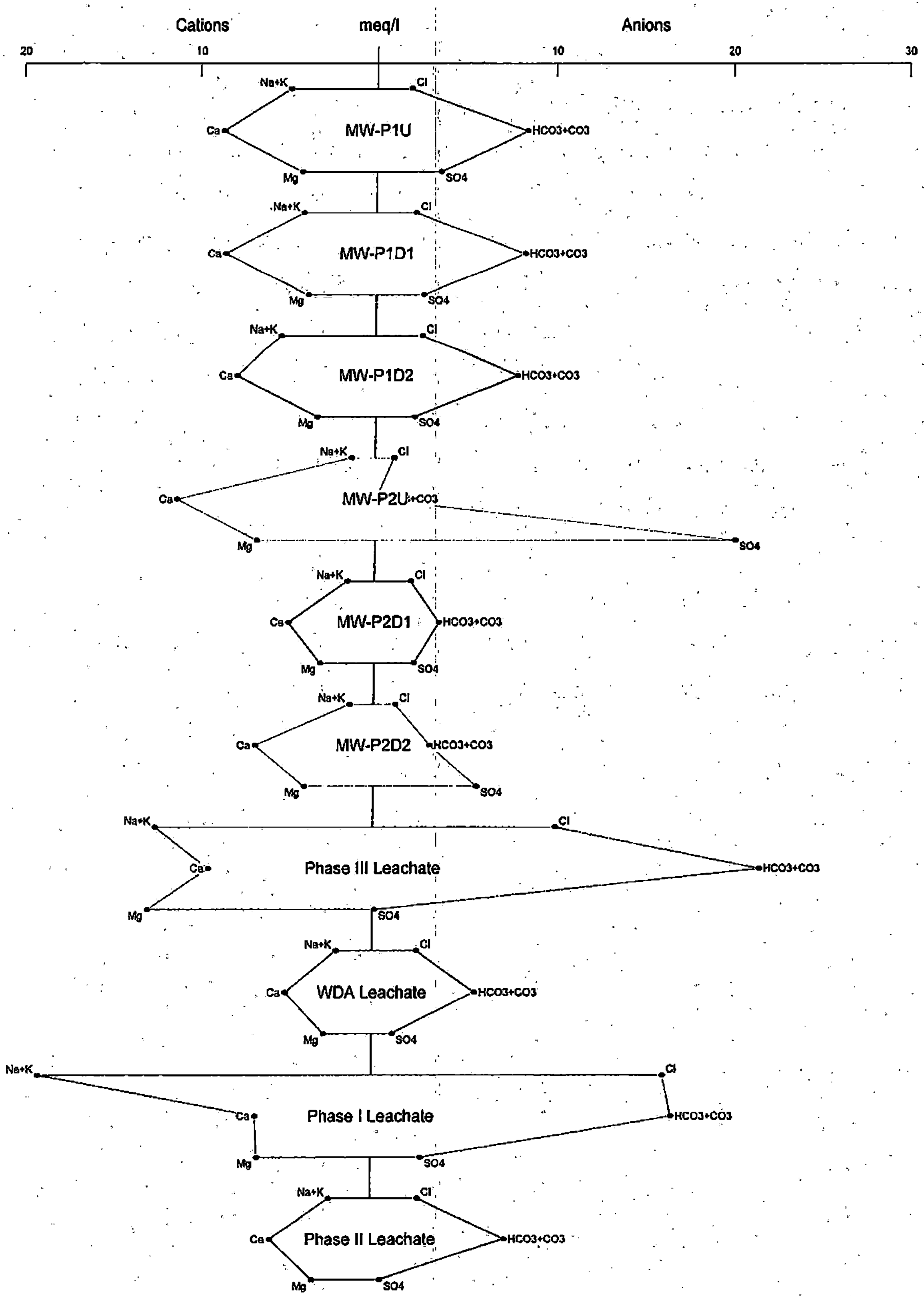


FIGURE 12
STIFF DIAGRAM OF LEACHATE POND NETWORK



APPENDIX D
LEACHATE SAMPLING AND ANALYSIS

The Leachate Collection Zones at Kelly Run Sanitation are sampled and analyzed quarterly for Form 50. Kelly Run's leachate and secondary collection zones consist of the Phase 1, Phase 2, Phase 3A, and Phase 3B leachate collection and detection zones, as well as the leachate collection zone for the closed Western Disposal Area. The Leachate Detection Zones (LDZ) are sampled annually (4th Quarter event) in accordance with Form 50 requirements. These LDZs were previously sampled and analyzed for the Form 50 LDZ indicator analytes. Based on a review of this baseline fluid composition data, the Phase 2, Phase 3A, and Phase 3B LDZs were determined to be potentially leachate influenced. Therefore, annual sampling for the full Form 50 parameter list was completed during the 4th Quarter 2009 at these LDZs, while the Phase 1 LDZ was sampled for the Form 50 indicator analytes.

Based on a review of the data for the LDZ samples collected during the 4th Quarter 2009, MCL exceedances were noted. Therefore, the Form 19 detection zone add-on list was included in the annual groundwater sampling program completed during the 1st Quarter 2010.

APPENDIX E

METHANE PROBE MONITORING

1.0 INTRODUCTION

The following methane monitoring report is a summary and evaluation of the gas monitoring and control activities for the Kelly Run Sanitation, Inc. Landfill (KRS) located in Forward Township, Allegheny County, Pennsylvania for the quarterly period ending March 31, 2010. Results of the quarterly gas probe monitoring data collected on March 18 – 26, 2010 are submitted herein as part of the KRS Quarterly Monitoring Report.

1.1 BACKGROUND

KRS Landfill currently maintains and utilizes a system of landfill gas monitoring probes to monitor for the presence of methane. The current system includes 133 probes located spatially around the landfill boundaries (13 probes were decommissioned prior to the 4th Quarter 2006 event in accordance with the August 14, 2006 WDA Permit). The landfill gas monitoring probes are generally constructed of a single perforated PVC well casing installed at a shallow depth, often referred to as the "A" zone. Nested probes (two or three probes at the same location) monitor for the presence of methane in the shallow ("A"), intermediate ("B"), and deep ("C") zones.

The majority of gas monitoring probes in both the Western and Municipal Disposal Areas are screened within the Benwood Limestone Aquifer. Some of the shallow probes monitor the Waynesburg and Uniontown Formations above the Benwood Limestone. Deeper probes monitor the Sewickley, Redstone, and Pittsburgh Sandstones.

1.2 REPORTING REQUIREMENTS

The monitoring of landfill gas (methane) concentrations is conducted on a quarterly basis following the requirements set forth in PA Code Title 25 Section 273.292, Gas Control and Monitoring and Pennsylvania Department of Environmental Protection (PADEP) Permit Conditions.

PA Code 273.292 provides the following criteria to determine the regulatory compliance of combustible gas levels at the landfill:

1. 25% of the lower explosive limit (LEL) at a structure within the landfill site.
2. The LEL at the boundaries of the landfill site.
3. 25% of the LEL in an adjacent area, including buildings or structures on adjacent areas.

The maximum acceptable combustible gas concentrations permitted under current regulatory and permit requirements is 5.0% methane in air. This concentration is equal to 100% of the LEL. Concentrations above the maximum acceptable limit of 5.0% are reported to PADEP and the Allegheny County Health Department (ACHD). In the event an exceedance of this limit occurs in a given monitoring probe, daily monitoring of the probe is initiated and continued until the methane level reaches acceptable limits. Persistent exceedances occasionally require additional gas extraction efforts in those areas.

1.3 LANDFILL GAS MONITORING PROCEDURES

Written protocols for conducting methane monitoring were established in accordance with Permit Condition No. 21 of the Solid Waste Landfill Permit Modification dated February 6, 1997 and the August 14, 2006 WDA Permit.

The Landfill Gas Monitoring Procedures for obtaining methane concentration readings from the monitoring probes were submitted to PADEP in a report dated April 7, 1997. Specifically, the

procedures address the need to maintain the proper instrument calibration, obtain and document all necessary readings, evaluate probe water levels, and the dewatering of probes were necessary. KRS conducted the landfill gas monitoring according to these approved procedures. In addition, any liquids removed during probe dewatering are disposed of into the leachate manhole consistent with the requirements of the March 13, 1996 Consent Decree.

2.0 LANDFILL GAS MONITORING

The landfill gas monitoring system consists of both single and nested design probes. All 133 gas monitoring probes were tested for the presence of methane. The following Gas Monitoring Probe Field Log presents a summary of the methane and LEL concentrations for each gas monitoring probe tested.

No methane was detected at the LEL level at any probe for this monitoring period.

3.0 CONCLUSIONS

The LEL concentration was not detected at any monitoring probe. Therefore, all methane gas monitoring probes in the KRS network continue to demonstrate compliance with the acceptable regulatory limit of 5.0%.

APPENDIX F
DUST FALL ANALYSIS

Dust collection analysis is performed monthly through the placement of dust fall jars around Kelly Run Sanitation Landfill. The jars are collected monthly and fresh jars are placed in the holders.

No samples exceeded the maximum dust fall of 1.5 mg/cm^2/month during the 1st Quarter 2010 as specified in the PA 25 §273.217 and cited in PA 25§131.3.

WASTE MANAGEMENT

KELLY RUN SANITATION, INC. LANDFILL
FORWARD TOWNSHIP, ALLEGHENY COUNTY
PENNSYLVANIA
PADEP I.D. NO. 100663

2009 ANNUAL GROUNDWATER REPORT

Prepared for:
Waste Management
June 2010

Prepared by:
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4000 Triangle Lane, Suite 200
Export, PA 15632
CEC Project 050558

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1.0 INTRODUCTION

1.1 SCOPE AND PURPOSE

This report summarizes the results of the 2009 calendar year groundwater and surface water monitoring activities at Kelly Run Sanitation, Inc. Landfill (KRS) located in Forward Township, Allegheny County. This work satisfies the annual requirements of the Pennsylvania Code 25, Chapter 273.313 and Condition 16 of the Pennsylvania Department of Environmental Protection (PADEP) Permit (I.D. No. 100663, February 6, 1997).

The groundwater and surface water monitoring program at KRS incorporates permanent monitoring elements to provide environmental protection during and after landfill development. All field work, sampling methodologies, data evaluation, data quality assurance/quality control (QA/QC), chemical analysis, and time-series analysis were conducted in accordance with the approved site permit. The Site-Specific Monitoring and Reporting Plan was submitted to PADEP in 1995 (DEI, 1995) and was revised by the Western Disposal Area's (WDA) Groundwater Monitoring and Reporting Plan (MFG, Inc., 2003) which was approved with the August 14, 2006 revision to the WDA post-closure care permit.

1.2 SITE DESCRIPTION AND BACKGROUND

KRS has been operating since 1965 and consists of five disposal units (Figures 1, 2, and 3):

- 17-acre pre-RCRA disposal area identified as the Old Waste Area (OWA) has been closed since early 1970s and was capped in 1997;
- A 9.0-acre Phase I Area closed municipal waste landfill that was capped in 1996 (operating permit issued March 14, 1991);
- A 24.3-acre Phase II Area closed municipal waste landfill that was capped in 1998 (operating permit issued January 18, 1995);

- A Phase III Area active municipal waste landfill (operating permit issued February 6, 1997); and

- The 35.0-acre Western Disposal Area (WDA), a closed and capped hazardous waste landfill (Hazardous Waste Postclosure Permit U.S. Environmental Protection Agency ID No. PAD004810222).

KRS currently receives municipal waste at a rate of about 8,000 tons per month. The facility consists of a 408-acre parcel, of which 48 acres are currently approved for active waste disposal. KRS is permitted to take municipal solid waste and other approved special wastes.

The WDA consists of approximately 35 acres and is a closed hazardous waste disposal landfill. The WDA was constructed with an engineered clay liner and leachate collection system (i.e., interceptor drain) and was capped with a very low density polyethylene (VLDPE) geomembrane in the early 1990s. The 17-acre OWA is a natural renovation landfill that was capped in 1997. Phase I (9.0 acres) and Phase II (24.3 acres) landfill areas were constructed as lined landfills and were completely capped and closed in 1998. Both Phase I and Phase II have leachate detection zones. The Phase III area is a 48-acre permitted double-lined landfill with a leachate detection zone. The Phase III landfill is the only active waste placement area at the landfill and receives approximately 280 tons per day of solid waste.

2.0 GEOLOGY AND HYDROGEOLOGY

2.1 REGIONAL GEOLOGY

KRS is located within the Appalachian Physiographic Province (Heath, 1984). This province is characterized by relatively deeply incised valleys and low rolling hills. KRS is constructed within the head of a relatively deeply incised valley and upon the adjacent ridge to the south. The surficial bedrock geology of KRS consists of Paleozoic deposits of the Monongahela and Conemaugh Groups. No Quaternary sedimentary deposits exist at the site. The site area has been deep-mined for the Pittsburgh Coal.

2.2 LOCAL GEOLOGY

The Pennsylvanian-aged Monongahela Group is defined as the interval between the base of the Waynesburg Coal and the base of the Pittsburgh Coal. The Monongahela has an average thickness of 250 feet in this portion of the southwestern Pennsylvania and consists of five units, from stratigraphically lowest to highest: Pittsburgh, Redstone, Sewickley, Uniontown, and Waynesburg. The Pittsburgh Formation consists of approximately 100 feet of coal, shale, limestone, and sandstone and is conformably overlain by the Redstone Formation. The Redstone is approximately 80 feet thick and includes the interval between the Redstone Limestone and the base of the Sewickley Coal. The Redstone Coal is approximately 2 to 4 feet thick and the Pittsburgh Coal seam is 8 to 9 feet thick.

2.2.1 Uniontown Formation

The Uniontown Formation, the uppermost unit exposed at KRS, consists of 50 to 90 feet of interbedded shale, claystone, limestone, and sandstone. Only 20 feet of the Upper Member of the Uniontown is exposed on the adjacent hilltops. The Lower Member of the Uniontown Formation rests conformably beneath the Upper Member. In this area, the Lower Member is approximately 30 to 35 feet thick. The basal unit of the Lower Member is the Uniontown Coal, which is usually represented by 12 to 18 inches of carbonaceous shale. The lithologic units above the Uniontown Coal are comprised of

interbedded sandstone and shale through the lower and middle parts of the member and interbedded calcareous shale and argillaceous limestones in the upper part. Both the Upper Member and the Lower Member are moderately to severely weathered in outcrops exposed by earthmoving activities at the site.

2.2.2 Pittsburgh Formation

The Pittsburgh Formation is located stratigraphically between the Uniontown Coal at the top and the Pittsburgh Coal at the base. This formation has a thickness of about 255 feet at the site. The Pittsburgh Formation consists of five members, from stratigraphically highest to lowest: Upper Member, Sewickley Member, Fishpot Member, Redstone Member, and the Lower Member.

2.2.2.1 Upper Member - The Upper Member extends from the bottom of the Uniontown Coal to the top of the Benwood Limestone Bed in the Sewickley Member. The Upper Member is in the range of 80 to 90 feet thick at the site and is comprised of interbedded shale, claystone, and argillaceous limestone. Many of the shale and claystone beds are calcareous. There are four persistent limestone beds in the Upper Member that are identified from stratigraphically highest to lowest as Limestone D, Limestone C, Limestone B, and Limestone A (Dodge, 1985 and Johnson, 1929). These limestone beds were considered part of the Benwood Limestone in older geologic literature, but they have been divided into individual beds in the Upper Member in recent geologic information. The four limestone beds range in thickness from about 1-foot to as much as 10 feet thick, although where the limestone beds are thicker than about 2 feet, they commonly have thin interbedded shale or claystone partings several inches thick.

2.2.2.2 Sewickley Member - The Sewickley Member extends from the top of the Benwood Limestone at the top of the Sewickley Member to the base of the Sewickley Coal at the base of this member. In the Phase III landfill area and adjacent areas, the Sewickley Member is 50 to 60 feet thick. The Benwood, which is the dominant unit in this member, is comprised of interbedded argillaceous limestone, shale, claystone, and fine-grained sandstone beds. Individual limestone beds can be 5 to 6 feet thick, but are

typically about 2 feet thick. Calcareous shale, claystone, and fine-grained sandstone beds separate the limestone beds. The bottom 5 to 10 feet of the member is comprised of shale and includes the Sewickley Coal bed, which in this area is a carbonaceous shale bed up to 4 feet thick.

2.2.2.3 Fishpot Member - The Fishpot Member of the Monongahela Group occupies the interval from the bottom of the Sewickley Coal at the top to the top of a limestone bed, which is the uppermost bed in the underlying Redstone Member. The Fishpot Member has an average thickness of 20 feet at the site and is comprised of sandstone, limestone, and shale.

2.2.2.4 Redstone Member - The Redstone Member occupies the interval from the top of the limestone bed mentioned above to the bottom of the Redstone Coal. This member has a thickness in the range of 30 to 35 feet and is comprised of an argillaceous limestone bed in the upper 5 feet and is underlain by shale with some thin interbedded sandstone units. The Redstone Coal horizon, which is the basal unit of the member, varies in thickness from 2 to 4 feet thick within the area.

2.2.2.5 Lower Member - The Lower Member of the Monongahela Group occupies the interval from the bottom of the Redstone Coal at the top of the member to the bottom of the Pittsburgh Coal at the base of the member. The Lower Member is 70 to 80 feet thick and is comprised predominantly of shale and claystone. The Pittsburgh Coal, the basal unit in this member, has been deep-mined beneath the site area. The coal has a thickness of 8 to 9 feet in the vicinity of the site. Mine maps for the underground mine workings indicate that the coal was mined by the complete retreat method after room-and-pillar mining (DEI, 1996a).

2.2.3 Conemaugh Group

Underlying the Monongahela Group is the Conemaugh Group. This ground of rocks has a thickness of 550 to 600 feet in the western Pennsylvania area and is comprised of interbedded sandstone, shale, and claystone units with thin limestone beds and thin coal beds that are not economically important resources. The Conemaugh Group lies below drainage in the area.

2.3 STRUCTURAL GEOLOGY

The Appalachian Physiographic Province is characterized by a series of low amplitude, symmetrical, and subparallel anticlines and synclines. Regionally, these fold axes trend roughly north/northeast-south/southwest. KRS is located on the east limb of the gently folded Roaring Run (Murrysville) Anticline and strata at the site generally strike N80°E and dip 2°SE.

2.4 SITE HYDROGEOLOGY

The monitoring well network targets the water-bearing zones where any potential impact would be observed at the earliest possible time. Two aquifers have been identified at KRS: the Benwood Limestone and the Pittsburgh Coal. Vertical gradients between the aquifers are generally downward (DEI, 1995).

2.4.1 Benwood Limestone Hydrostratigraphic Unit

Groundwater occurs under perched conditions within the Benwood Limestone (DEI, 1996a). Published reports indicate that the Benwood Limestone is a poor producer of groundwater in southern Allegheny County (Piper, 1933). Piper (1933) indicates that in this area the yields from the Benwood Limestone are small and erratic and a considerable proportion of wells completed into this unit are unsuccessful.

Groundwater flow direction is dictated by the gentle southeast dip of bedrock that occurs throughout the site area. The horizontal gradient for the annual sampling event was 0.0079 ft/ft (calculated from MW-302 to MW-311) (Figure 2). Discharge from the Benwood Limestone Hydrostratigraphic unit is primarily to springs in the site area and local surface water bodies. The unnamed tributary to Fallen Timber Run is the principal receiving stream downgradient of the site.

Groundwater within the Benwood occurs as a result of secondary porosity caused by joint and fracture planes occurring within the rock. Primary porosity occurring with the Benwood appears to be negligible (DEI, 1996a). Groundwater within the Benwood occurs at the base of this unit, and downward vertical flow is restricted by the underlying carbonaceous shale of the Sewickley Coal horizon. Constant-rate pumping tests indicate that the measured hydraulic conductivity is approximately 1.14 x 10^{-3} cm/sec (3.23 ft/day) and calculated porosity is 10 percent (DEI, 1996a).

Wells drilled through the Benwood and completed in the Pittsburgh Coal are characterized by not having encountered groundwater. DEI (1996a and 1996b) noted that groundwater flow does not occur between the Benwood and the Pittsburgh Coal and the geochemical fingerprints for these individual hydrostratigraphic units are different.

Groundwater within the Benwood is classified as a calcium-magnesium bicarbonate type of water. However, groundwater sampled from wells located south (downgradient) of the WDA [reported from Benwood monitoring wells MW-302, MW-303 (redrilled as MW-303R), MW-305 (decommissioned), MW-306 (decommissioned), and MW-307] are dominant in sodium, chloride, or both sodium and chloride (DEI, 1996a).

2.4.2 Pittsburgh Coal Hydrostratigraphic Unit

The Pittsburgh Coal Hydrostratigraphic Unit consists of the remnant mine workings, voids, and stumps in the retreat-mined Pittsburgh Coal. Piper (1933) concluded from mining observations that the Pittsburgh Coal in this area is not generally a water-bearing unit. Groundwater quality in the Pittsburgh Coal is generally degraded due to the presence of elevated levels of metals and sulfate. DEI (1996b) reported that groundwater within the Pittsburgh Coal is, in general, a non-dominant cation sulfate type of water.

Groundwater in the Pittsburgh Coal occurs under unconfined conditions (DEI, 1996b). A mine pool probably exists downgradient of the landfill. Groundwater recovered from the generally dry Pittsburgh Coal groundwater monitoring wells shows an acid-mine drainage characteristic (i.e., elevated concentrations of sulfate, iron, magnesium, aluminum). Further, springs issuing from the Pittsburgh Coal 1 to 2 miles downgradient of the landfill show no influence related to leachate indicator parameters, but do show elevated acid-mine drainage constituents (DEI, 1996b). Consequently, DEI (1996b) concluded that the Benwood aquifer is not draining to the Pittsburgh Coal.

The Pittsburgh Coal unit occurs approximately 210 feet below the base of the active landfill (double-lined Phase III area). The Pittsburgh Coal has a measured hydraulic conductivity of 7.42 x 10^{-4} cm/sec (2.103 ft/day) (DEI, 1996b). Groundwater flow in this unit is structurally controlled and follows dip slope to the south (Figure 3). The Pittsburgh Coal for the annual sampling event had a measured horizontal hydraulic gradient (calculated from MW-201R to MW-211R1) to the south of 7.0 x 10^{-3} ft/ft (Figure 3). The effective porosity of the insitu Pittsburgh Coal is estimated at 10 percent (DEI, 1996b).

2.5 GROUNDWATER MONITORING NETWORK

2.5.1 Well Network

The monitoring well network at KRS previously included quarterly sampling at 25 groundwater monitoring wells completed within the Benwood Limestone and Pittsburgh Coal Hydrostratigraphic units. After the August 14, 2006 revision to the WDA post-closure care permit, the groundwater detection monitoring program for the WDA and municipal waste landfills at KRS was reduced to 21 groundwater monitoring wells that monitor the same two groundwater units. The groundwater monitoring well network targets the preferential flowpath for the facility as described in the approved Groundwater Monitoring Plan and is designed to detect a leachate release at the earliest possible time.

Detection Monitoring Well Network (Pre-August 14, 2006 WDA Permit Revision)

	Monitored Zone	Upgradient	Downgradient
1.	Benwood Limestone	MW-301R	MW-302, MW-303R, MW-304, MW-306D, MW-307D, MW-310D, MW-310R, MW-311, MW-312R, MWPZ-1, MWPZ-2, MWPZ-3
2.	Pittsburgh Coal	MW-201R	MW-204, MW-211R1, MW-212, MW-213R, MW-214
3.	Lower Leachate Pond (Pittsburgh Coal)	MW-P1U	MW-P1D1, MW-P1D2
4.	Upper Leachate Pond (Pittsburgh Coal)	MW-P2U	MW-P2D1, MW-P2D2

Detection Monitor Well Network (Post-August 14, 2006 WDA Permit Revision)

Monitored Zone	Upgradient	Downgradient
Benwood Limestone (Leachate Pond 3/4)	MW-301R	MW-302, MW-303R, MW-304, MW-307D, MW-310D, MW-310R, MW-311, MW-312R, MWPZ-1, MWPZ-2, MWPZ-3
Pittsburgh Coal	MW-201R	MW-204, MW-211R1
Lower Leachate Pond (Pittsburgh Coal)	MW-P1U	MW-P1D1, MW-P1D2
Upper Leachate Pond (Pittsburgh Coal)	MW-P2U	MW-P2D1, MW-P2D2

2.5.2 Groundwater Elevation Measurements

Prior to initiation of groundwater purging and sampling activities, depth to water and water level elevation (feet above mean sea level) were recorded to the nearest hundredth of a foot (Tables 1 and 2). The water level measurements are utilized in preparation of groundwater contour maps to determine groundwater flow direction and gradient at the site (Figures 2 and 3).

The annual groundwater sampling event occurred February 2 – 4, 2009 and water level measurements were recorded using an electronic water level meter in accordance with the field procedures outlined in the Sampling Plan (DEI, 1995).

Depth to groundwater was measured in each well and converted to elevations in feet above mean sea level (Table 2). Groundwater elevations for all four quarterly sampling events are comparable to historical groundwater elevation measurements.

2.6 GROUNDWATER GRADIENT AND FLOW VELOCITY

The horizontal groundwater seepage velocity downgradient of the landfill was estimated using the following equation:

$$V = \frac{(K_h i)}{n_e}$$

Where:

- V = average groundwater velocity;
- K_h = aquifer horizontal conductivity;
- i = average hydraulic gradient; and
- n_e = effective aquifer porosity (DEI, 1996).

The annual potentiometric surface map (February 2 – 4, 2009) of the Benwood Hydrostratigraphic Unit produced from water levels taken from monitoring wells on site indicates that groundwater flow in the Benwood Hydrostratigraphic Unit is from northwest to southeast with a horizontal gradient of 7.9×10^{-3} ft/ft (Figure 2). The average horizontal velocity of the Benwood Hydrostratigraphic Unit is 2.55×10^{-1} ft/day (93.1 ft/year), based upon an average hydraulic conductivity of 1.14×10^{-3} cm/sec (3.23 ft/day) (DEI, 1996a) and effective porosity of 10 percent (DEI, 1996a).

The potentiometric surface map (December 15 – 17, 2008) of the Pittsburgh Coal Hydrostratigraphic Unit produced from water levels taken from monitoring wells on site indicates that groundwater flow in the Pittsburgh Coal Hydrostratigraphic Unit is from north to south with a horizontal gradient of 7.0×10^{-3} ft/ft (Figure 3). The average horizontal groundwater velocity of the Pittsburgh Coal Hydrostratigraphic Unit is 1.47×10^{-1} ft/day (54 ft/year), based upon an average hydraulic conductivity of 7.42×10^{-4} cm/sec (2.103 ft/day) (DEI, 1996b) and effective porosity of 10 percent (DEI, 1996b).

2.7 SAMPLING AND ANALYTICAL PROGRAM

2.7.1 Field Program

Field sampling activities for the groundwater monitoring wells for the four quarterly events for the calendar year 2009 were performed according to groundwater monitoring and report requirements for the site. Monitoring well purging and sampling activities were implemented in accordance with the prescribed field procedures.

2.7.2 Laboratory Analysis and Monitoring Parameters

As described in the municipal site's Groundwater Sampling and Analysis Plan (CE Consultants, 1995) and the WDA's Groundwater Monitoring and Reporting Plan (MFG, Inc., 2003), the KRS Landfill monitoring list was selected based on an evaluation of site-specific information including background groundwater chemistry, leachate analytical results, and chemical detectability, mobility, and persistence. In accordance with the approved plan, monitoring wells at the site were analyzed for the quarterly and annual PADEP Form 19 constituents. The following list of parameters represents the annual constituent list for KRS Landfill in effect during the 1st Quarter 2009 annual sampling event in accordance with the recently revised (August 14, 2006) post-closure permit for the WDA.

DETECTION MONITORING
PADEP FORM 19 ANNUAL CONSTITUENTS

INORGANIC, METALS, AND GENERAL CHEMISTRY

Arsenic	Copper	Silver
Alkalinity, total*	Fluoride	Specific conductance,
Ammonia-nitrogen*	Lead	Field & Laboratory*
Barium	Iron	Sodium*
Bicarbonate (as $CaCO_3$)*	Magnesium*	Sulfate*
Cadmium	Manganese*	Total Organic Carbon*
Calcium*	Mercury	Total Dissolved Solids
Chemical Oxygen Demand*	Nitrate-Nitrogen	Total Phenolics
Chloride*	pH, Field & Laboratory*	Turbidity
Chromium	Potassium*	Zinc
	Selenium	* Indicator analyte

ORGANIC CHEMISTRY

Benzene	Dichlorodifluoromethane	4-Methyl-2-Pentanone
Bromoform	1,1-Dichloroethane	1,1,1,2-Tetrachloroethane
Bromomethane	1,1-Dichloroethene	1,1,2,2-Tetrachloroethane
Carbon Tetrachloride	1,2-Dichloroethane	Tetrachloroethene
Chlorobenzene	*cis*-1,2-Dichloroethene	Toluene
Chloroethane	*trans*-1,2-Dichloroethene	1,1,1-Trichloroethane
Chlorodibromomethane	1,2-Dichloropropane	1,1,2-Trichloroethane
3-Chloro-1-Propene	cis 1,3-Dichloropropene	Trichloroethene
1,2-Dibromoethane	trans 1,3-Dichloropropene	Trichlorofluoromethane
1,2-Dichlorobenzene	Ethylbenzene	1,2,3-Trichloropropane
1,3-Dichlorobenzene	Methyl chloride	Vinyl chloride
1,4-Dichlorobenzene	Methyl Ethyl Ketone	Xylene

ADDITIONAL CONSTITUENTS FOR:
MW-201, MW-204, MW-211R1, MW-P2U, MW-301R, MW-302R, MW-303R, MW-304, MW-307, MW-310R, MW-311D, AND MW-312R

QUARTERLY PARAMETERS	ANNUAL PARAMETERS
Total Organic Halogen	Lead
Chromium	Arsenic
Naphthalene	Aluminum
Creosote	Cyanide

ADDITIONAL CONSTITUENTS FOR:
MW-PZ-1, MW-PZ-2, AND MW-PZ-3

QUARTERLY PARAMETER	SEMI-ANNUAL PARAMETER
Total Organic Halogen	Naphthalene

All water samples collected at the site were delivered to Geochemical Testing, Inc. in Somerset, PA for chemical analysis. Geochemical Testing is certified in the Commonwealth of Pennsylvania for performing chemical analysis of the reported parameters. Original laboratory reports, submitted quarterly, detail specific reporting limits.

3.0 GEOCHEMICAL ANALYSIS

3.1 VOLATILE ORGANIC COMPOUNDS

The Benwood Limestone Hydrostratigraphic Unit has been shown to contain volatile organic compounds and naphthalene through several assessment reports (DEI, 1996a) and remediation of the aquifer was also addressed in a 1996 Consent Order. Further, Benwood groundwater monitoring well MW-303R is a recovery well that has operated continuously as part of the remediation.

Volatile organic compounds have historically been detected in Benwood groundwater monitoring wells. Benzene was detected in MW-302 (1st, 2nd, 3rd, and 4th Quarters 2009) and MW-303R (1st, 2nd, and 4th Quarters 2009). Ethylbenzene was detected in MW-302 (1st, 2nd, and 4th Quarters 2009). Finally, naphthalene was detected in MW-302 (4th Quarter 2009). Acetone and chlorobenzene was detected in MW-312R during the first quarter monitoring event at concentrations of 26.9 ug/l and 9.8 ug/l, respectively. Except for benzene, each of these detections is well below the corresponding Pennsylvania Act 2 Statewide Health Standard for the parameter and are within historical levels for each monitoring point.

Volatile organic compounds were not detected above established reporting limits in any other wells.

3.2 TIME-SERIES ANALYSIS

The time versus concentration plots of five leachate indicator parameters (ammonia nitrogen, alkalinity, TDS, chloride, and sodium) were analyzed for significant trends, unexpected geochemical signatures, and anomalously high results.

3.2.1 Benwood

As shown on the time-series chart (Figure 4), no historically significant upward trend in the concentration of any inorganic parameter was noted for the Benwood

Hydrostratigraphic Unit during the calendar year 2009. Geochemical analyses show that groundwater from the Benwood is a calcium bicarbonate (MW-304) to sodium chloride (MW-311 and MW-312R) dominant water type which is roughly consistent with that observed from previous studies (e.g., DEI, 1996a) (Figures 7 and 8). Noted exceptions to the previous studies are that the groundwater geochemistry from MW-303R (recovery well) has changed from a sodium bicarbonate to a calcium-magnesium bicarbonate type of water, and MW-310R is a sodium bicarbonate water type. Both MW-310D and MW-310R were dry during the annual sampling event in February 2009.

3.2.2 Pittsburgh Coal

As shown on the time-series chart (Figure 5), no significant upward trend in the concentration of any indicator parameter was noted for the Pittsburgh Coal Hydrostratigraphic Unit except alkalinity at MW-204 and MW-211R1. Concentrations for ammonia nitrogen, total dissolved solids, chloride, and sodium at MW-211R1 appear to fluctuate seasonally. In addition, since the concentrations of sodium, chloride, and total dissolved solids are higher at MW-211R1 than that of leachate, trends observed at this monitoring well do not appear to be the result of a leachate influence. Groundwater from the Pittsburgh Coal can generally be characterized as a calcium bicarbonate (MW-204) to sodium chloride (MW-211R1) water type (Figures 9 and 10). MW-201R was dry during the annual sampling event in February 2009. No significant upward trends were noted in any of the remaining wells monitoring the Pittsburgh Coal Hydrostratigraphic Unit.

3.2.3 Leachate Pond Wells

No significant upward trend in the concentration of any indicator parameter was noted for the Pittsburgh Coal Hydrostratigraphic Unit in the lower and upper leachate pond areas (Figure 6). Groundwater from this portion of the Pittsburgh Coal characterizes, in general, as a non-dominant cation-calcium bicarbonate-sulfate type of water (Figures 11 and 12).

3.2.4 Lysimeters

Two lysimeter sets (ML-1A and ML-2A) are located beneath the first two stages of the Phase III Area and are monitored for the presence of water. No water was detected in these lysimeters during 2009.

3.3 SURFACE WATER ANALYSIS

Prior to the August 14, 2006 revision to the WDA post-closure care permit, 21 surface water samples (KR-1, KR-2, FTR-1, FTR-2, ST-1, ST-2, ST-3, ST-4, ST-5, Benwood Spring, SP-1, SP-2, SP-3, SP-4, SP-5, SP-6, SP-8, SP-10, SP-11, SP-W, and SS-3) were collected quarterly and annually for Form 19 and semi-volatile organic compounds pursuant to the KRS Sampling and Analysis Plan. In accordance with the revised Groundwater Monitoring and Reporting Plan approved with the August 14, 2006 WDA Permit, sampling and analysis is now required at KR-2, FTR-2, ST-2, ST-3, ST-5, SP-3, and SP-4 (with provisions for additional requirements if certain groundwater and/or detection zone conditions occur). The SP-series surface water points monitor the Benwood which crops out along the southern portion of the landfill. Surface water points ST-2 and FTR-2 monitor Fallen Timber Run. Surface water point KR-2 monitors an unnamed tributary to Fallen Timber Run. Surface point ST-3 monitors an unnamed tributary upstream of ST-2, and ST-5 is upgradient of ST-3 on the unnamed tributary to Fallen Timber Run.

All surface water analyses were consistent with the historical data for these monitoring points and show no detection of volatile organic compounds above established reporting limits.

4.0 CONCLUSIONS

Groundwater, surface water, and leachate samples were collected quarterly according to appropriate groundwater sampling procedures for Quarterly and Annual Form 19 parameters. The data is consistent with past sampling results.

- The active and closed areas of KRS are underlain by two monitored hydrostratigraphic units: Benwood Limestone and the Pittsburgh Coal.
- KRS was sampled for Annual Form 19 groundwater and surface water constituents on February 2 – 4, 2009.
- The Benwood Limestone Hydrostratigraphic Unit has a horizontal gradient to the southeast of 7.9×10^{-3} ft/ft, with a velocity of 0.255 ft/day (93.1 ft/year) (Figure 2).
- The Pittsburgh Coal Hydrostratigraphic Unit has a horizontal gradient to the south of 7.0×10^{-3} ft/ft, with a velocity of 1.47×10^{-1} ft/day (54 ft/year) (Figure 3).
- Volatile organic compounds were detected from Benwood Limestone groundwater monitoring wells MW-302, MW-303R, and MW-312R during 2009. The Benwood wells historically have had detections of volatile organic compounds. No other wells detected any volatile organic compounds during 2009.
- The Benwood Spring discharges to the leachate system and is handled as leachate.
- Time-series analyses of leachate parameters do not show significant upward trends in multiple leachate indicator parameters for the Benwood or the Pittsburgh Coal hydrostratigraphic units.
- Groundwater elevation contour maps show that local groundwater gradient and velocity have been temporally consistent for the Benwood and the Pittsburgh Coal Hydrostratigraphic units.
- Concentrations of trace metals and other inorganic constituents in groundwater samples were generally consistent (i.e., no upward trends) with historical concentrations.

- Surface water analyses of metals and inorganic parameter concentrations are consistent with historical concentrations.
- No volatile organic compounds were detected above established reporting limits in the surface water samples during 2009.

The major conclusions of this report are:

1. The groundwater monitoring network is capable of monitoring the Benwood and Pittsburgh Coal Hydrostratigraphic units in the immediate vicinity of KRS.
2. The frequency of sampling and the constituents analyzed can effectively determine if a release has occurred.

5.0 REFERENCES

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Youchak and Youchak. (1997). "Kelly Run Sanitation Landfill Solid Waste Relocation and Restoration Plan." Approved plan for the removal of water in the Old Waste Area, submitted to the Pennsylvania Department of Environmental Protection April 1997.

TABLES

TABLE 1

KELLY RUN LANDFILL
PADEP I.D. NO. 100663

FIRST QUARTER 2009
FIELD PARAMETERS

AQUIFER	MONITORING POINT	SAMPLE DATE	SAMPLE TIME	WATER LEVEL[1] (ft)	WELL DEPTH[1] (ft)	WATER VOLUME[2] (gallons)	THREE VOLUMES (gallons)	WATER PURGED (gallons)	VOLUMES PURGED	FIELD PARAMETERS pH	COND (µS/m)	TEMP (C)	COMMENTS
Benwood Limestone	MW-301R	02/02/2009	DRY	135.20	135.85								Dry
	MW-302R	02/03/2009	11:35 AM	149.21	170.26	13.68	41.05	2.00	0.15	6.16	9446	14.5	
	MW-303R	02/04/2009	10:20 AM	N/A	63.20					6.45	1373	8.9	
	MW-304	02/04/2009	09:50 AM	42.97	64.15	13.77	41.30	3.00	0.22	6.40	1279	12.0	
	MW-307D	02/03/2009	12:40 PM	157.80	168.20	6.76	20.28	2.00	0.30	6.62	3574	12.4	
	MW-310D	02/03/2009	DRY		128.84								Dry
	MW-310R	02/03/2009	DRY		108.81								Dry
	MW-311	02/03/2009	01:50 PM	102.91	116.85	9.06	27.18	0.80	0.09	7.44	8132	11.2	
	MW-312R	02/03/2009	01:25 PM	170.10	182.65	8.16	24.47	5.00	0.61	6.43	6908	11.7	
	PZ-1	02/02/2009	11:15 AM	98.90	119.32	13.27	39.82	2.00	0.15	7.35	2897	13.2	
	PZ-2	02/02/2009	11:40 AM	112.40	129.45	11.08	33.25	3.00	0.27	7.23	3023	12.7	
	PZ-3	02/02/2009	12:00 PM	93.80	111.08	11.23	33.70	1.50	0.13	6.60	2717	13.1	
Pittsburgh Coal	MW-201R	02/02/2009	DRY		276.44								Dry
	MW-204	02/03/2009	12:10 PM	294.91	310.00	9.81	29.43	3.00	0.31	6.36	916	12.8	
	MW-211R1	02/04/2009	10:50 AM	193.50	196.92	2.22	6.67	1.80	0.81	6.52	6654	9.1	
Lower	MW-P1U	02/02/2009	02:30 PM	18.42	36.75	11.91	35.74	13.00	1.09	6.59	1677	12.9	
Leachate	MW-P1D1	02/02/2009	03:25 PM	27.78	38.82	7.18	21.53	2.50	0.35	6.82	1314	12.2	
Pond	MW-P1D2	02/02/2009	01:45 PM	25.35	42.12	10.90	32.70	4.00	0.37	6.51	1282	12.5	
Upper	MW-P2U	02/04/2009	01:05 PM	89.85	92.34	1.62	4.86	1.50	0.93	4.09	1765	6.8	
Leachate	MW-P2D1	02/04/2009	01:45 PM	91.39	96.50	3.32	9.96	1.00	0.30	6.49	769	9.1	
Pond	MW-P2D2	02/04/2009	12:25 PM	92.10	98.61	4.23	12.69	3.00	0.71	6.59	888	9.0	
Surface Water	KR-2	02/02/2009	03:00 PM							8.07	517	2.0	
	FTR-2	02/04/2009	11:25 AM							8.59	836	2.9	
	ST-2	02/04/2009	11:15 AM							8.40	698	3.1	
	ST-3	02/04/2009	11:05 AM							7.75	752	5.1	
	ST-5	02/04/2009	10:50 AM							8.40	878	3.5	
	SP-3	02/04/2009	02:00 PM							7.16	1075	12.0	
	SP-4	02/04/2009	DRY										Dry
Leachate	PHASE 1 DZ	02/02/2009											Dry
	PHASE 2 DZ												Sampled Annually
	PHASE 3A DZ												Sampled Annually
	PHASE 3B DZ												Sampled Annually
	PHASE 1	02/02/2009	03:30 PM							6.51	4220	23.7	
	PHASE 2	02/02/2009	02:35 PM							6.59	2861	19.3	
	PHASE 3	02/03/2009	02:25 PM							6.42	3169	14.6	
	WDA LEACH.	02/02/2009	03:40 PM							6.15	738	15.7	
Phase III Subgrade	ML-1A	02/04/2009	DRY										Lysimeter is Dry
Monitoring Pt.	ML-2A	02/04/2009	DRY										Lysimeter is Dry

Notes:
[1] Measured from top of inner casing.
[2] Calculated from 0.65 gallons per foot of water
Sampled by Cody Salmon, Aquascape
ft = feet

C = Degrees Centigrade
µS/m = microSiemens/meter
gpm = gallons per minute
N/A = Not Applicable
NP = Not Provided

TABLE 1

KELLY RUN LANDFILL
PADEP I.D. NO. 100663

SECOND QUARTER 2009
FIELD PARAMETERS

AQUIFER	MONITORING POINT	SAMPLE DATE	SAMPLE TIME	WATER LEVEL[1] (ft)	WELL DEPTH[1] (ft)	WATER VOLUME[2] (gallons)	THREE VOLUMES (gallons)	WATER PURGED (gallons)	VOLUMES PURGED	FIELD PARAMETERS pH	COND (µS/m)	TEMP (C)	COMMENTS
Benwood Limestone	MW-301R	05/04/2009	DRY	134.90	135.85								Dry
	MW-302R	05/06/2009	11:35 AM	148.80	170.26	13.95	41.85	1.50	0.11	5.97	9120	14.1	
	MW-303R	05/04/2009	02:00 PM	43.00	63.20	13.13	39.39			6.07	1268	13.4	
	MW-304	05/06/2009	12:20 PM	43.70	64.15	13.29	39.88	2.00	0.15	6.30	1230	13.5	
	MW-307D	05/06/2009	11:05 AM	157.80	168.20	6.76	20.28	1.50	0.22	6.63	3546	13.2	
	MW-310D	05/06/2009	09:30 AM	122.70	128.84	3.99	11.97	2.40	0.60	12.30	8900	13.5	
	MW-310R	05/06/2009	DRY	104.40	108.81	2.87	8.60	2.50	0.87				Purged Dry, No Recovery, No Sample
	MW-311	05/06/2009	08:45 AM	102.80	116.85	9.13	27.40	0.80	0.09	7.43	7985	11.9	
	MW-312R	05/05/2009	11:35 AM	162.80	182.65	12.90	38.71	2.00	0.16	6.24	6570	12.2	
	PZ-1	05/05/2009	04:05 PM	99.00	119.32	13.21	39.62	2.00	0.15	7.38	2925	13.9	
	PZ-2	05/05/2009	08:50 AM	113.60	129.45	10.30	30.91	1.50	0.15	7.16	2899	13.4	
	PZ-3	05/05/2009	04:25 PM	98.40	111.08	8.24	24.73	2.00	0.24	6.60	2731	14.4	
Pittsburgh Coal	MW-201R	05/04/2009	DRY	273.10	276.44	2.17	6.51						Dry
	MW-204	05/06/2009	10:30 AM	294.40	310.00	10.14	30.42	4.00	0.39	6.86	8022	13.1	
	MW-211R1	05/04/2009	02:40 PM	194.00	196.92	1.90	5.69	1.20	0.63	6.27	7099	13.5	
Lower	MW-P1U	05/05/2009	03:00 PM	20.00	36.75	10.89	32.66	20.00	1.84	7.27	1373	14.1	
Leachate	MW-P1D1	05/05/2009	11:40 AM	29.90	38.82	5.80	17.39	2.50	0.43	6.78	1288	12.8	
Pond	MW-P1D2	05/05/2009	11:15 AM	26.35	42.12	10.25	30.75	3.00	0.29	6.53	1199	12.5	
Upper	MW-P2U	05/05/2009	01:20 PM	90.10	92.34	1.46	4.37	1.50	1.03	3.81	1181	12.0	
Leachate	MW-P2D1	05/05/2009	02:05 PM	91.85	96.50	3.02	9.07	1.00	0.33	6.55	785	10.9	
Pond	MW-P2D2	05/05/2009	12:45 PM	92.95	98.61	3.68	11.04	2.00	0.54	6.41	830	10.8	
Surface Water	KR-2	05/04/2009	11:00 AM							8.69	395	14.2	
	FTR-2	05/04/2009	03:20 PM							7.31	530	13.8	
	ST-2	05/04/2009	10:40 AM							7.34	477	13.2	
	ST-3	05/04/2009	10:30 AM							6.69	488	13.1	
	ST-5	05/04/2009	10:20 AM							6.74	312	12.9	
	SP-3	05/04/2009	01:10 PM							6.73	922	11.9	
	SP-4	05/04/2009	DRY										Dry
Leachate	PHASE 1 DZ												Sampled Annually
	PHASE 2 DZ												Sampled Annually
	PHASE 3A DZ												Sampled Annually
	PHASE 3B DZ												Sampled Annually
	PHASE 1	05/04/2009	11:25 AM							6.51	3943	27.4	
	PHASE 2	05/04/2009	11:35 AM							6.43	3062	18.1	
	PHASE 3	05/04/2009	12:50 PM							6.21	4454	20.0	
	WDA LEACH.	05/04/2009	11:06 AM							6.09	1940	18.7	
Phase III Subgrade	ML-1A	05/06/2009	DRY										Lysimeter is Dry
Monitoring Pt.	ML-2A	05/06/2009	DRY										Lysimeter is Dry

Notes:
[1] Measured from top of inner casing.
[2] Calculated from 0.65 gallons per foot of water
Sampled by Cody Salmon, Aquascape
ft = feet

C = Degrees Centigrade
µS/m = microSiemens/meter
gpm = gallons per minute
N/A = Not Applicable
NP = Not Provided

TABLE 1

KELLY RUN LANDFILL
PADEP I.D. NO. 100663

THIRD QUARTER 2009
FIELD PARAMETERS

AQUIFER	MONITORING POINT	SAMPLE DATE	SAMPLE TIME	WATER LEVEL[1] (ft)	WELL DEPTH[1] (ft)	WATER VOLUME[2] (gallons)	THREE VOLUMES (gallons)	WATER PURGED (gallons)	VOLUMES PURGED	FIELD PARAMETERS			COMMENTS
										pH	COND (µS/m)	TEMP (C)	
Benwood Limestone	MW-301R	08/24/2009	DRY	DRY	135.85								Dry
	MW-302R	08/25/2009	01:15 PM	149.40	170.26	13.56	40.68	8.00	0.59	6.25	4421	15.8	
	MW-303R	08/26/2009	12:30 PM	45.30	63.20	11.64	34.91			7.28	850	20.0	
	MW-304	08/24/2009	10:40 AM	48.90	64.15	9.91	29.74	2.50	0.25	6.32	1250	14.1	
	MW-307D	08/25/2009	02:45 PM	157.90	168.20	6.69	20.09	1.50	0.22	6.56	3517	14.6	
	MW-310D	08/24/2009	DRY	DRY	128.84								Insufficient Water to Sample
	MW-310R	08/24/2009	DRY	DRY	108.81								Insufficient Water to Sample
	MW-311	08/26/2009	09:55 AM	104.00	116.85	8.35	25.06	0.80	0.10	7.33	7945	12.9	
	MW-312R	08/25/2009	09:35 AM	164.90	182.65	11.54	34.61	3.00	0.26	6.35	6532	13.2	
	PZ-1	08/25/2009	11:10 AM	100.70	119.32	12.10	36.31	4.00	0.33	7.20	2684	16.7	
	PZ-2	08/25/2009	11:45 AM	115.80	129.45	8.87	26.62	4.00	0.45	7.24	2876	14.9	
	PZ-3	08/25/2009	12:15 PM	99.00	111.08	7.85	23.56	2.00	0.25	6.58	2670	17.6	
Pittsburgh Coal	MW-201R	08/24/2009	DRY	DRY	276.44								Dry
	MW-204	08/25/2009	02:00 PM	259.10	310.00	33.09	99.26	4.00	0.12	7.81	1738	14.8	
	MW-211R1	08/24/2009	01:20 PM	193.20	196.92	2.42	7.25	4.50	1.86	6.27	1824	16.0	
Lower Leachate Pond	MW-P1U	08/25/2009	09:50 AM	20.80	36.75	10.37	31.10	14.00	1.35	6.42	1421	14.1	
	MW-P1D1	08/25/2009	09:40 AM	29.30	38.82	6.19	18.56	5.00	0.81	6.76	1311	13.2	
	MW-P1D2	08/25/2009	09:15 AM	26.00	42.12	10.48	31.43	4.00	0.38	6.49	1303	12.6	
Upper Leachate Pond	MW-P2U	08/26/2009	DRY	92.30	92.34	0.03	0.08						Insufficient Water to Sample
	MW-P2D1	08/26/2009	11:35 AM	94.60	96.50	1.24	3.71	0.75	0.61	6.56	915	17.7	
	MW-P2D2	08/26/2009	10:40 AM	95.00	98.61	2.35	7.04	2.00	0.85	6.46	889	13.9	
Surface Water	KR-2	08/24/2009	DRY										Insufficient Water to Sample
	FTR-2	08/24/2009	11:50 AM							7.05	1474	19.5	
	ST-2	08/24/2009	11:30 AM							8.03	798	18.9	
	ST-3	08/24/2009	11:40 AM							7.82	1248	18.6	
	ST-5	08/24/2009	11:20 AM							7.94	1246	19.0	
	SP-3	08/24/2009	12:45 PM							7.02	1210	15.5	
	SP-4	08/24/2009	DRY										Dry
Leachate	PHASE 1 DZ												Sampled Annually
	PHASE 2 DZ												Sampled Annually
	PHASE 3A DZ												Sampled Annually
	PHASE 3B DZ												Sampled Annually
	PHASE 1	08/24/2009	01:50 PM							6.59	7979	26.6	
	PHASE 2	08/24/2009	03:00 PM							6.62	5710	23.5	
	PHASE 3	08/24/2009	01:00 PM							6.44	6500	20.9	
	WDA LEACH.	08/24/2009	02:40 PM							6.03	2643	25.5	
Phase III Subgrade Monitoring Pt.	ML-1A	08/24/2009	DRY										Lysimeter is Dry
	ML-2A	08/24/2009	DRY										Lysimeter is Dry

Notes:
[1] Measured from top of inner casing.
[2] Calculated from 0.65 gallons per foot of water
Sampled by Cody Salmon, Aquascape
ft = feet

C = Degrees Centigrade
µS/m = microSiemens/meter
gpm = gallons per minute
N/A = Not Applicable
NP = Not Provided

TABLE 1

KELLY RUN LANDFILL
PADEP I.D. NO. 100663

FOURTH QUARTER 2009
FIELD PARAMETERS

AQUIFER	MONITORING POINT	SAMPLE DATE	SAMPLE TIME	WATER LEVEL[1] (ft)	WELL DEPTH[1] (ft)	WATER VOLUME[2] (gallons)	THREE VOLUMES (gallons)	WATER PURGED (gallons)	VOLUMES PURGED	FIELD PARAMETERS pH	COND (µS/m)	TEMP (C)	COMMENTS
Benwood Limestone	MW-301R	11/16/2009	DRY	DRY	135.85								Insufficient Water to Sample
	MW-302R	11/17/2009	01:20 PM	150.20	170.26	13.04	39.12	2.50	0.19	6.01	9074	15.8	
	MW-303R	11/16/2009	11:30 AM	45.50	63.20	11.51	34.52	4.00	0.35	5.98	1256	12.1	
	MW-304	11/16/2009	10:50 AM	49.40	64.15	9.59	28.76	4.00	0.42	6.40	1263	13.5	
	MW-307D	11/17/2009	02:15 PM	158.10	168.20	6.57	19.70	2.50	0.38	6.50	3640	13.7	
	MW-310D	11/17/2009	DRY	126.80	128.84	1.33	3.98	0.80	0.60				Insufficient Water to Sample
	MW-310R	11/17/2009	DRY	104.10	108.81	3.06	9.18	2.00	0.65				Insufficient Water to Sample
	MW-311	11/18/2009	10:10 AM	104.40	116.85	8.09	24.28	0.60	0.07	7.34	7965	11.9	
	MW-312R	11/18/2009	09:40 AM	170.70	182.65	7.77	23.30	3.00	0.39	6.36	6624	11.9	
	PZ-1	11/17/2009	12:30 PM	101.40	119.32	11.65	34.94	2.50	0.21	7.23	2778	13.8	
	PZ-2	11/17/2009	12:40 PM	116.50	129.45	8.42	25.25	4.00	0.48	7.26	3020	13.1	
	PZ-3	11/17/2009	03:35 PM	101.80	111.08	6.03	18.10	2.00	0.33	6.56	2713	15.1	
Pittsburgh Coal	MW-201R	11/16/2009	DRY	DRY	276.44								Insufficient Water to Sample
	MW-204	11/17/2009	01:55 PM	296.10	310.00	9.03	27.11	4.00	0.44	6.74	2718	13.7	
	MW-211R1	11/16/2009	12:50 PM	193.74	196.92	2.07	6.20	2.10	1.02	6.38	6140	13.4	
Lower	MW-P1U	11/17/2009	10:30 AM	20.20	36.75	10.76	32.27	14.00	1.30	6.45	1500	12.9	
Leachate	MW-P1D1	11/17/2009	10:15 AM	29.80	38.82	5.86	17.59	4.00	0.68	6.69	1317	12.2	
Pond	MW-P1D2	11/17/2009	09:45 AM	26.45	42.12	10.19	30.56	4.00	0.39	6.37	1295	12.4	
Upper	MW-P2U	11/18/2009	DRY	DRY	92.34								Dry
Leachate	MW-P2D1	11/18/2009	DRY	DRY	96.50								Dry
Pond	MW-P2D2	11/18/2009	11:05 AM	95.40	98.61	2.09	6.26	2.00	0.96	6.49	965	12.5	
Surface Water	KR-2	11/16/2009	12:50 PM							6.15	943	12.5	
	FTR-2	11/16/2009	12:30 PM							6.61	1521	12.9	
	ST-2	11/16/2009	12:15 PM							7.65	846	12.2	
	ST-3	11/16/2009	12:05 PM							7.86	1243	12.4	
	ST-5	11/16/2009	11:55 AM							7.93	1145	12.5	
	SP-3	11/16/2009	01:15 PM							6.48	1221	13.1	
	SP-4	11/16/2009	DRY										Dry
Leachate	PHASE 1 DZ	11/17/2009	10:45 AM							6.51	1312	12.7	
	PHASE 2 DZ	11/17/2009	10:30 AM							6.55	2081	13.5	
	PHASE 3A DZ	11/17/2009	02:15 PM							6.15	3554	13.4	
	PHASE 3B DZ	11/16/2009	03:30 PM							6.33	19190	13.9	
	PHASE 1	11/17/2009	10:20 AM							6.62	9106	16.2	
	PHASE 2	11/17/2009	10:40 AM							6.61	5687	13.4	
	PHASE 3	11/16/2009	02:18 PM							6.41	8410	14.9	
	WDA LEACH.	11/16/2009	10:15 AM							6.33	2311	14.2	
Phase III Subgrade	ML-1A	11/17/2009	DRY										Lysimeter is Dry
Monitoring Pt.	ML-2A	11/17/2009	DRY										Lysimeter is Dry

Notes:
[1] Measured from top of inner casing.
[2] Calculated from 0.65 gallons per foot of water
Sampled by Cody Salmon, Aquascape
ft = feet

C = Degrees Centigrade
µS/m = microSiemens/meter
gpm = gallons per minute
N/A = Not Applicable
NP = Not Provided

TABLE 2

KELLY RUN LANDFILL
PADEP I.D. NO. 100663

2009 WATER-LEVEL ELEVATIONS

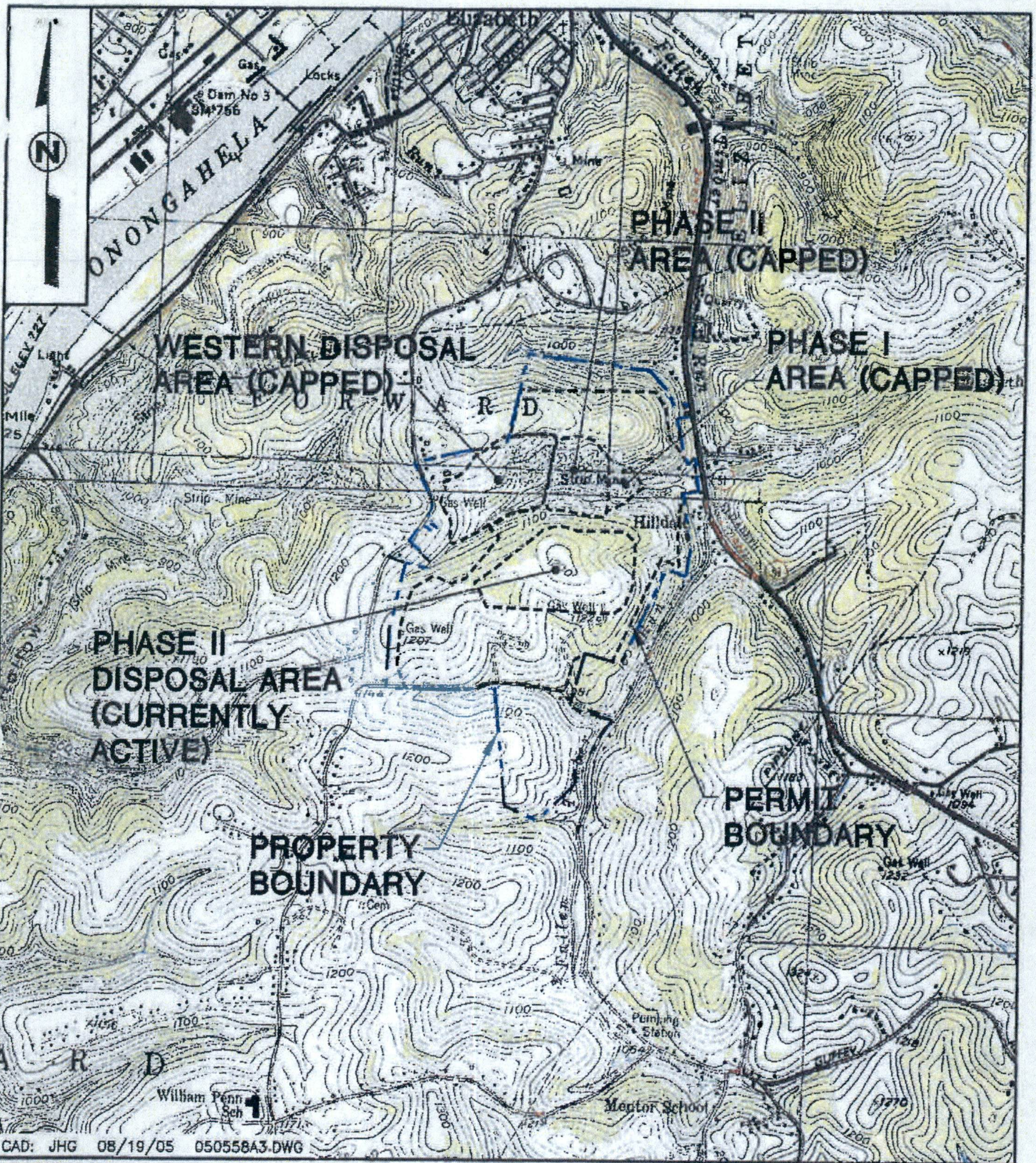
AQUIFER	MONITORING POINT	GRADIENT POSITION	MEASUREMENT POINT ELEV.[1] (ft amsl)	WATER LEVEL ELEVATION[2] (ft amsl)			
				FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER
Benwood Limestone	MW-301R	U	1169.67	1034.47	1034.77	Dry	Dry
	MW-302	D	1154.41	1005.20	1005.61	1005.01	1004.21
	MW-303R[3]	D	NA	NA	1610.57	1608.27	NA
	MW-304	D	1055.14	1012.17	1011.44	1006.24	1005.74
	MW-307D	D	1165.07	1007.27	1007.27	1007.17	1006.97
	MW-310D	D	1099.42	DRY	976.72	Dry	972.62
	MW-310R	D	1099.39	DRY	994.99	Dry	995.29
	MW-311	D	1100.37	997.46	997.57	996.37	995.97
	MW-312R	D	1171.46	1001.36	1008.66	1006.56	1000.76
	PZ-1	D	1119.32	1020.42	1020.32	1018.62	1017.92
	PZ-2	D	1135.94	1023.54	1022.34	1020.14	1019.44
	PZ-3	D	1124.39	1030.59	1025.99	1025.39	1022.59
Pittsburgh Coal	MW-201R	U	1158.13	DRY	885.03	Dry	DRY
	MW-204	D	1163.25	868.34	868.85	904.15	867.15
	MW-211R1	D	1064.00	870.50	870.00	870.80	870.26
Lower Leachate Pond	MW-P1U	U	892.73	874.31	872.73	871.93	872.53
	MW-P1D1	D	891.18	863.40	861.28	861.88	861.38
	MW-P1D2	D	888.43	863.08	862.08	862.43	861.98
Upper Leachate Pond	MW-P2U	U	NA	NA	NA	NA	NA
	MW-P2D1	D	963.17	871.78	871.32	868.57	DRY
	MW-P2D2	D	963.17	871.07	870.22	868.17	867.77

Notes:

[1] Elevation for the top of the PVC from well logs.
[2] Measured from the top of the 4" PVC riser pipe. Measured by Cody Salmon, Aquascape
[3] Groundwater Recovery Well

ft = foot
ft amsl = feet above mean sea level
NA = Not Available
N/A = Not Applicable

FIGURES



REFERENCE
U.S.G.S. 7.5 MINUTE TOPOGRAPHIC
QUADRANGLE MAPS OF GLASSPORT,
MCKESSPORT, MONOGAHELA AND DONORA, PA

SCALE
2000 0 2000 FT.

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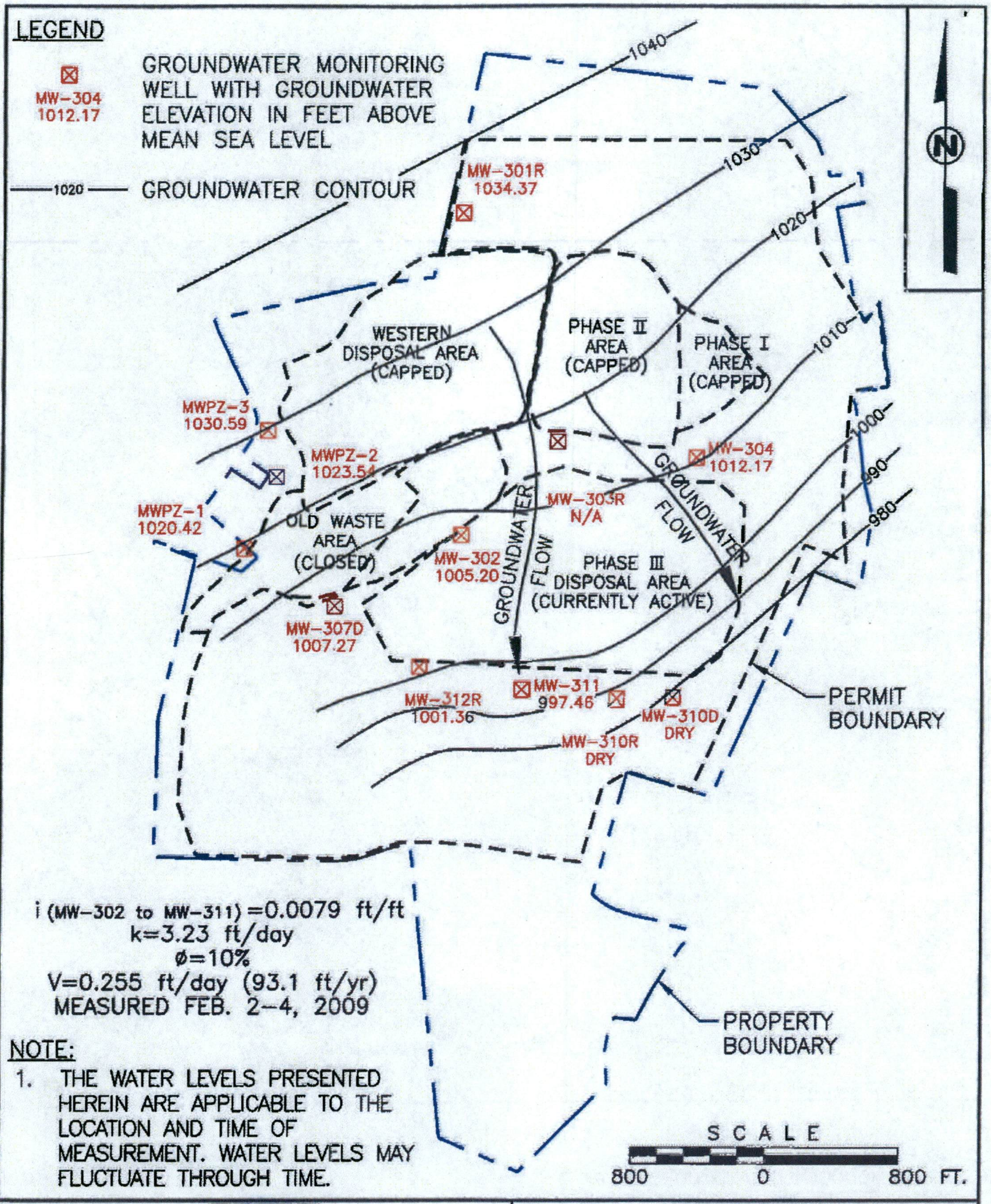
U.S.G.S. SITE LOCATION MAP

KELLY RUN LANDFILL
PERMIT NO. 100663

DWN. BY: JHG	SCALE:	DATE:	PROJECT NO.:	
CHKD. BY: KCD	AS SHOWN	08/19/05	050558	FIGURE NO. 1



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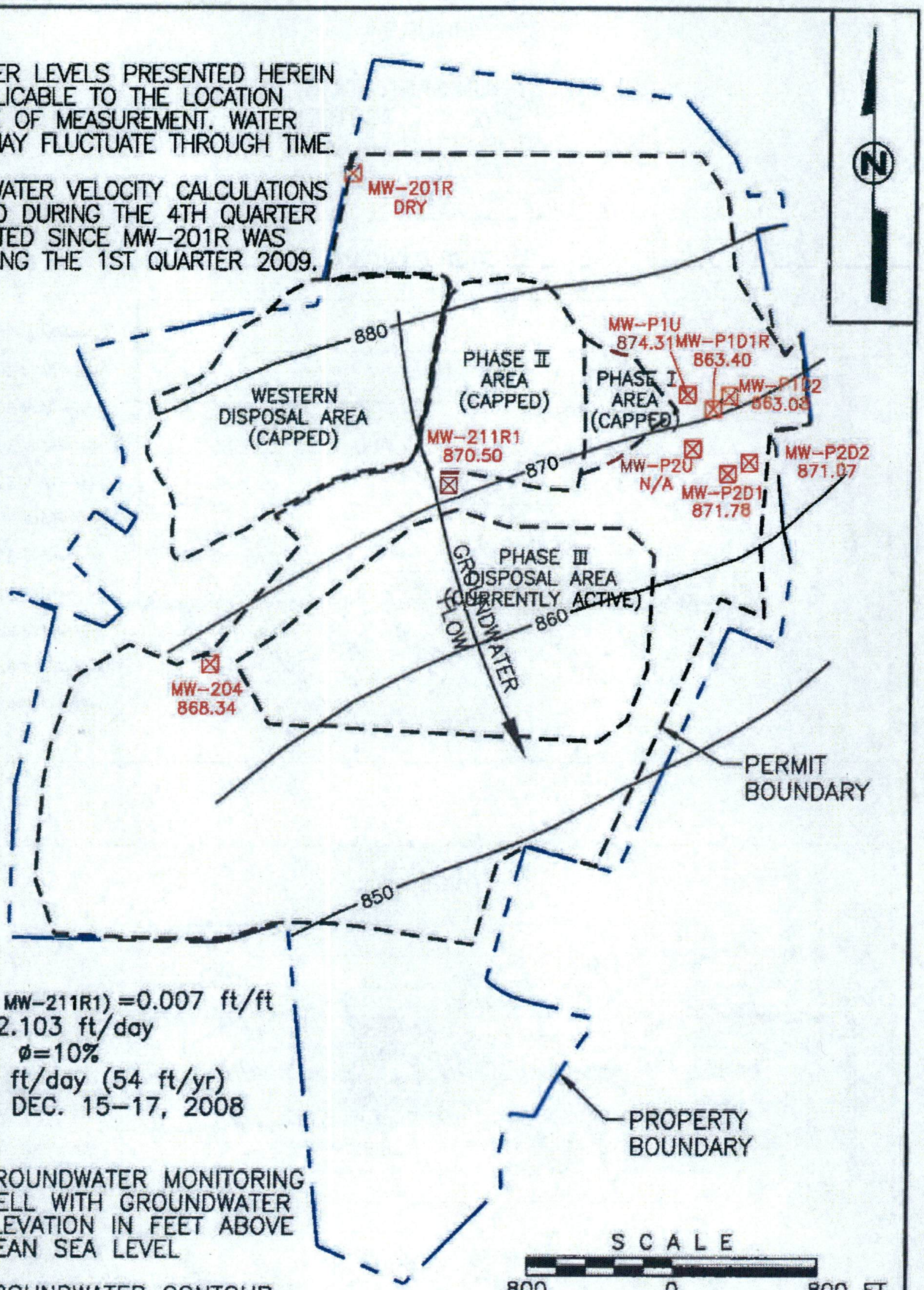
BENWOOD LIMESTONE POTENTIOMETRIC MAP
KELLY RUN LANDFILL
PERMIT NO. 100663

DWN. BY: JHG	SCALE:	DATE:	PROJECT NO.:	
CHKD. BY: RJT	AS SHOWN	04/01/09	050-558.0109	FIGURE NO. 2

G:\PROJECTS_J5\050558\DWG\050558A37.DWG (DMCNALLY) - APR 13, 2009 - 16:39:

NOTE:

1. THE WATER LEVELS PRESENTED HEREIN ARE APPLICABLE TO THE LOCATION AND TIME OF MEASUREMENT. WATER LEVELS MAY FLUCTUATE THROUGH TIME.
2. GROUNDWATER VELOCITY CALCULATIONS MEASURED DURING THE 4TH QUARTER 2008 LISTED SINCE MW-201R WAS DRY DURING THE 1ST QUARTER 2009.



$i_{(MW-201R \text{ to } MW-211R1)} = 0.007$ ft/ft

$k = 2.103$ ft/day

$\phi = 10\%$

$V = 0.147$ ft/day (54 ft/yr)

MEASURED DEC. 15-17, 2008

LEGEND

⊠ MW-P2D1 871.78 — GROUNDWATER MONITORING WELL WITH GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL

—870— GROUNDWATER CONTOUR

SCALE

800 0 800 FT.

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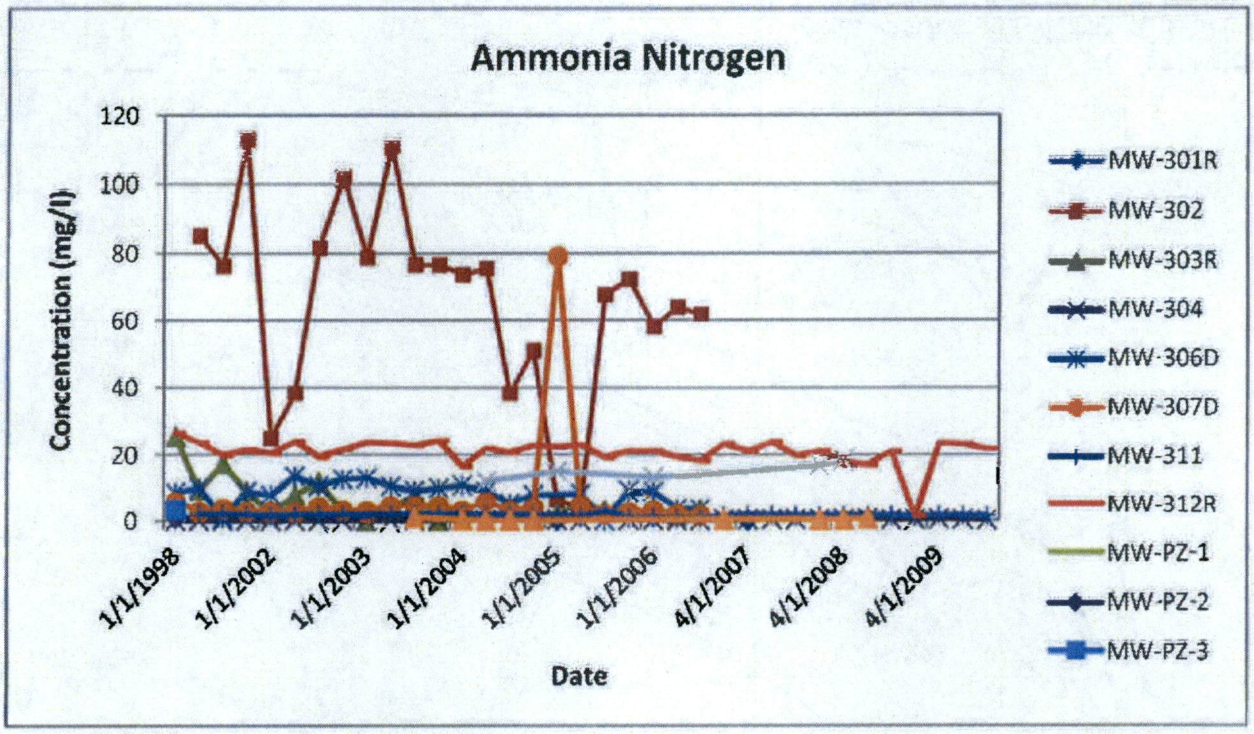
PITTSBURGH COAL
POTENTIOMETRIC MAP
KELLY RUN LANDFILL
PERMIT NO. 100663

DWN. BY: JHG	SCALE:	DATE:	PROJECT NO.:	
CHKD. BY: RST	AS SHOWN	04/01/09	050-558.0109	FIGURE NO. 3

G:\PROJECTS J5\050558\DWG\050558A38.DWG (DMCNALLY) - APR 13, 2009 - 16:56.

FIGURE 4

KELLY RUN SANITATION, INC
BENWOOD LIMESTONE
TIME SERIES PLOTS



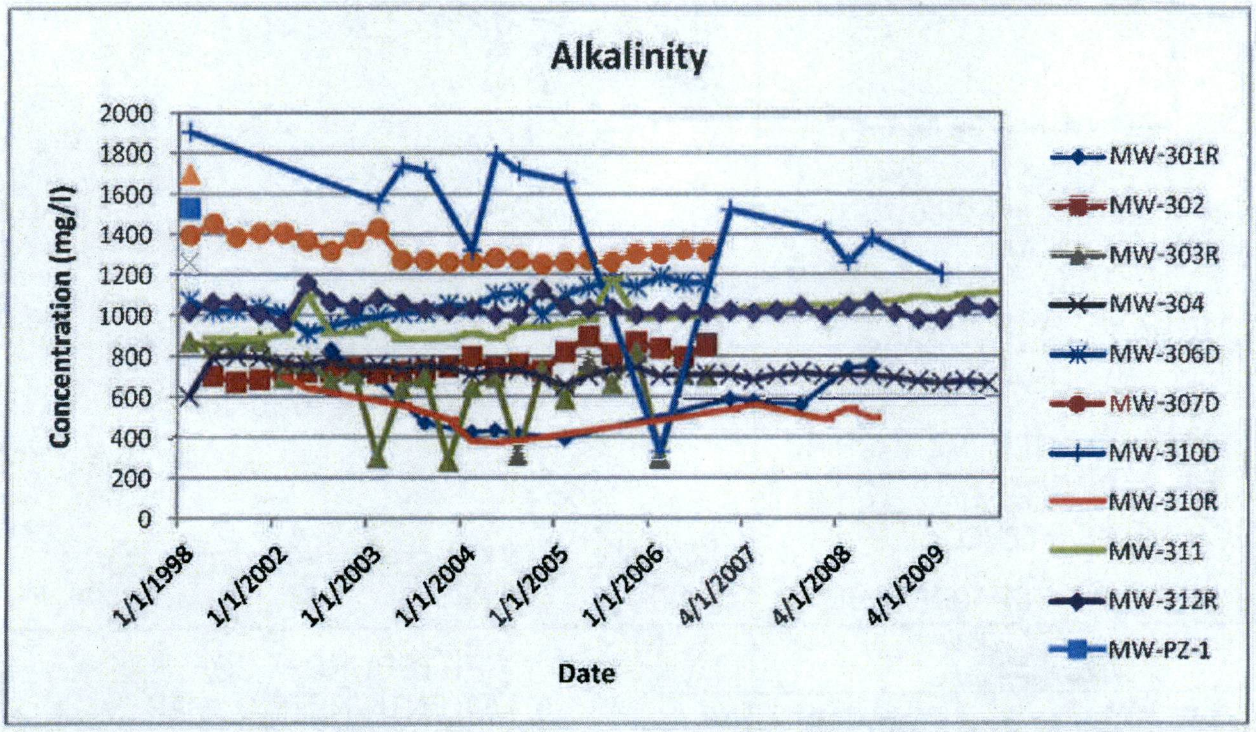
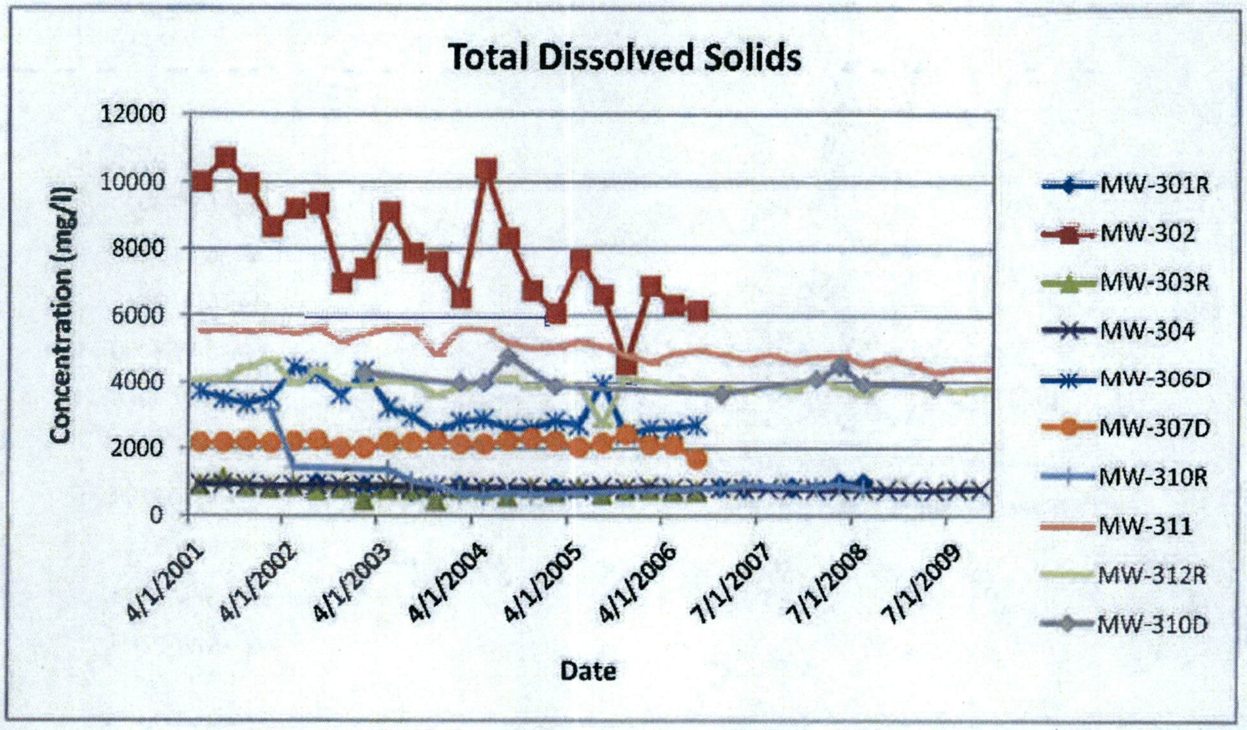


FIGURE 4

KELLY RUN SANITATION, INC
BENWOOD LIMESTONE
TIME SERIES PLOTS



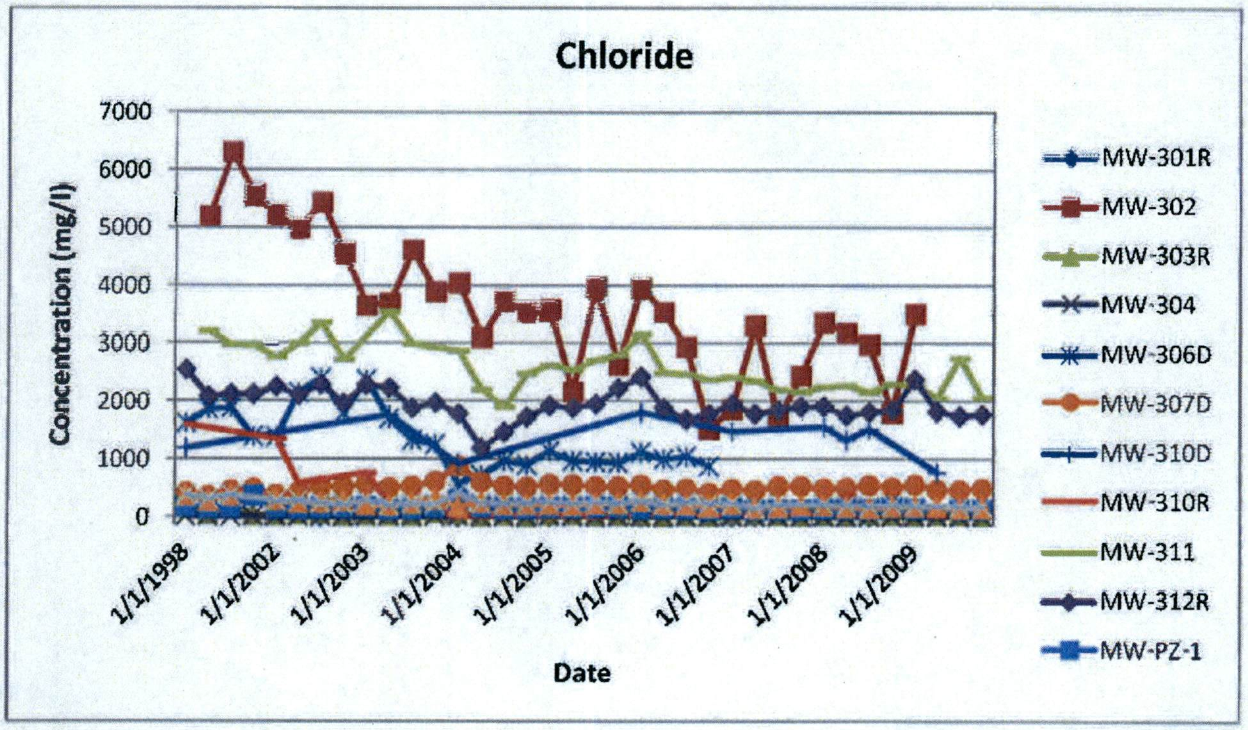


FIGURE 4

KELLY RUN SANITATION, INC
BENWOOD LIMESTONE
TIME SERIES PLOTS

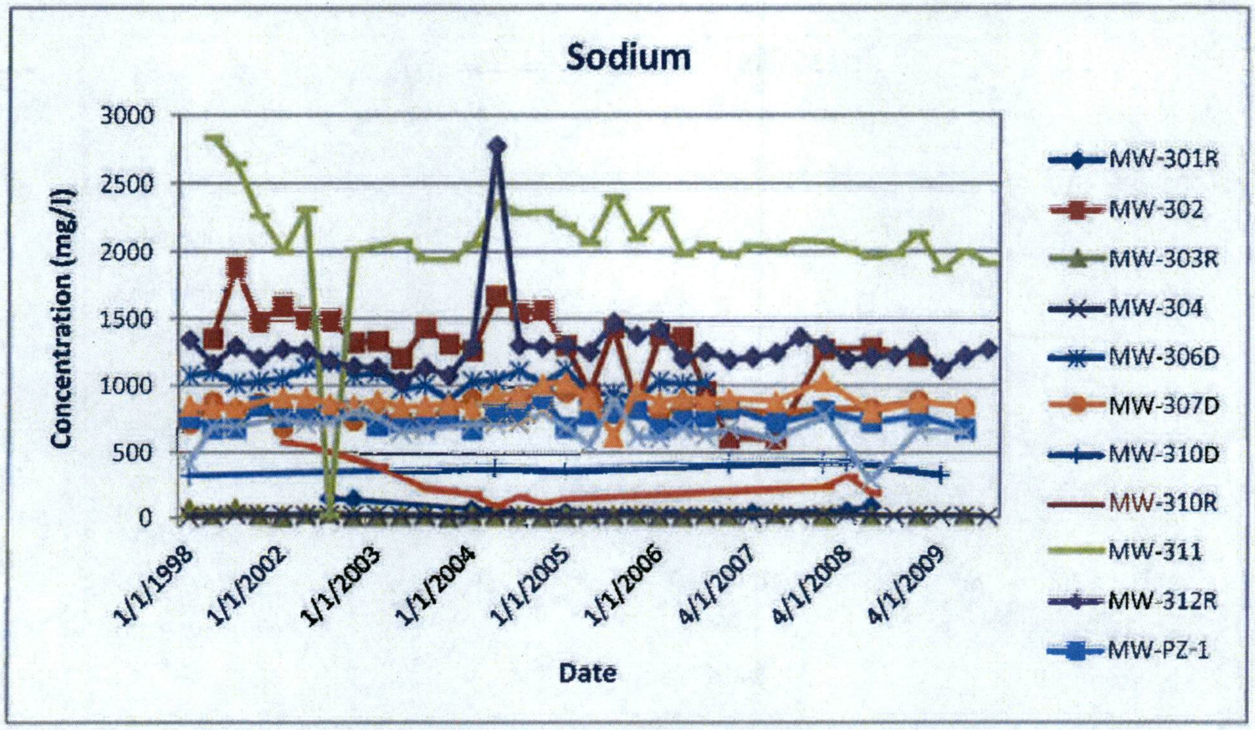
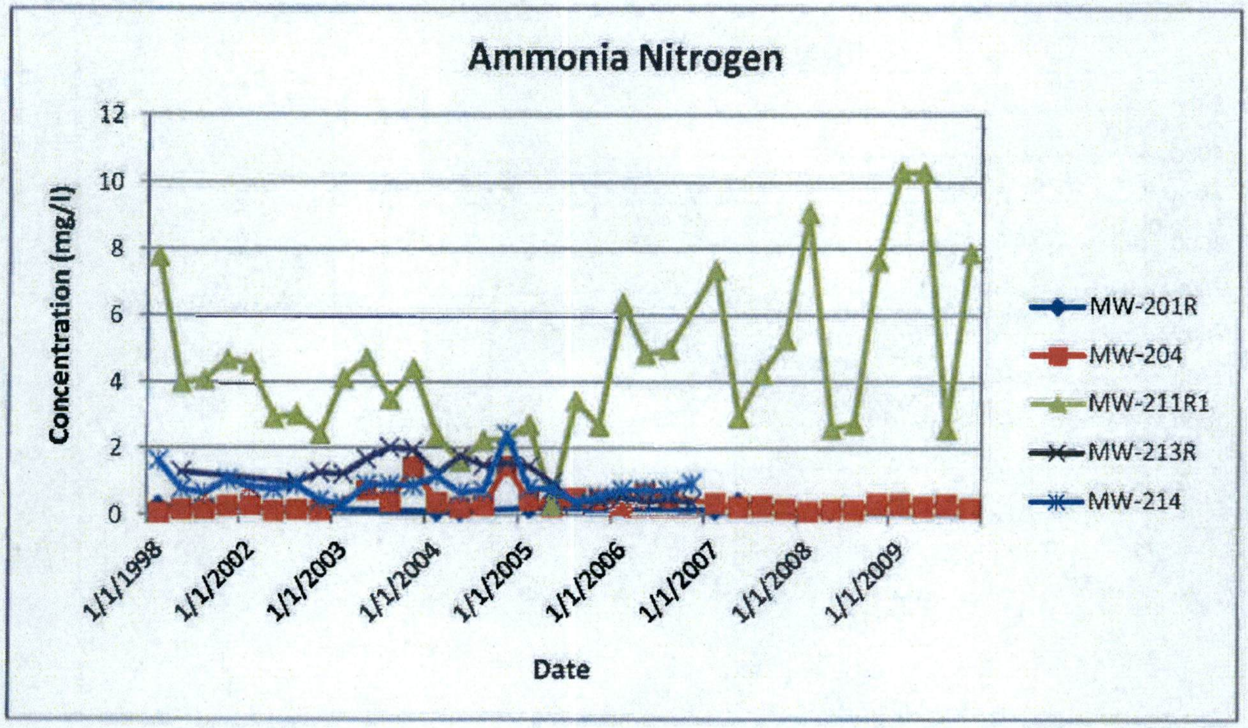


FIGURE 5

KELLY RUN SANITATION, INC
PITTSBURGH COAL
TIME SERIES PLOTS



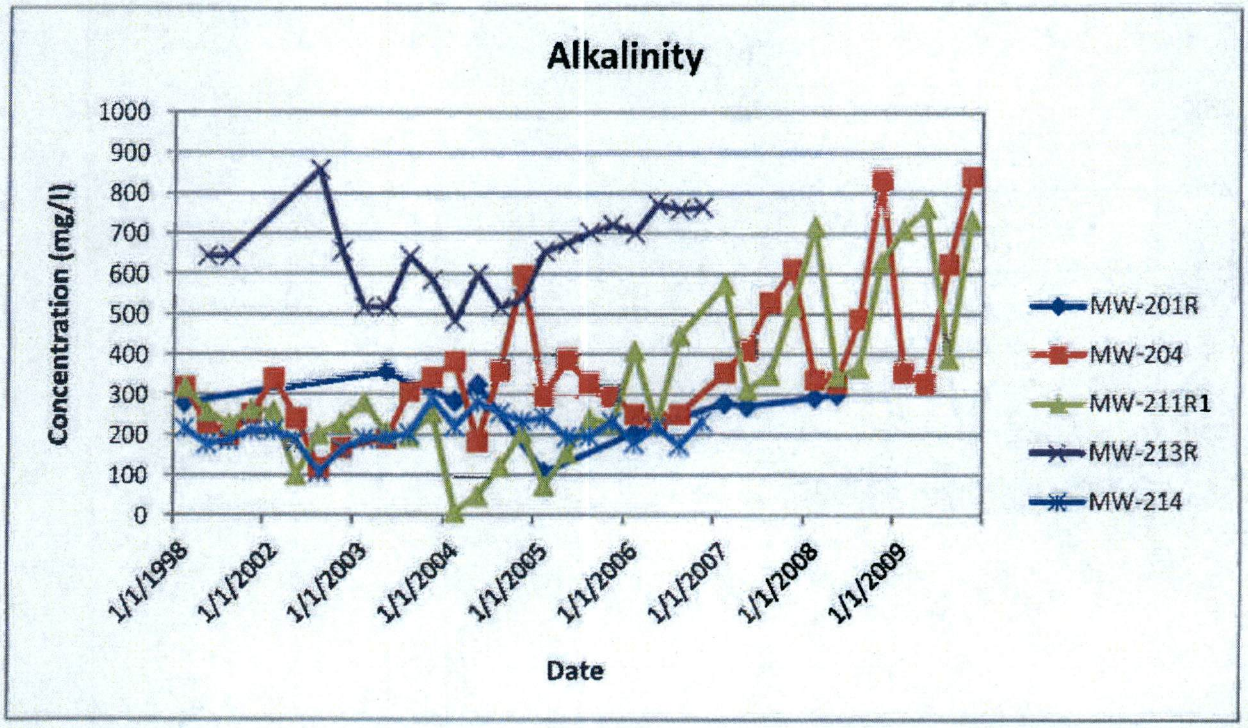
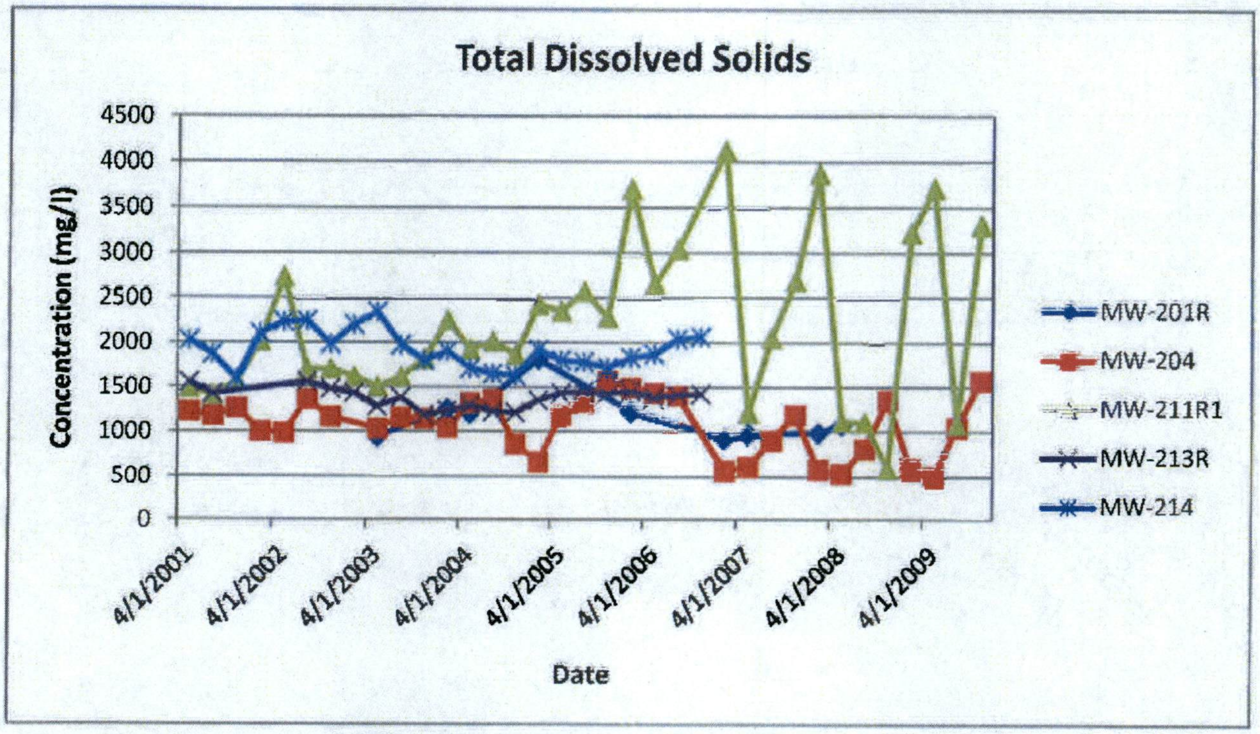


FIGURE 5

KELLY RUN SANITATION, INC
PITTSBURGH COAL
TIME SERIES PLOTS



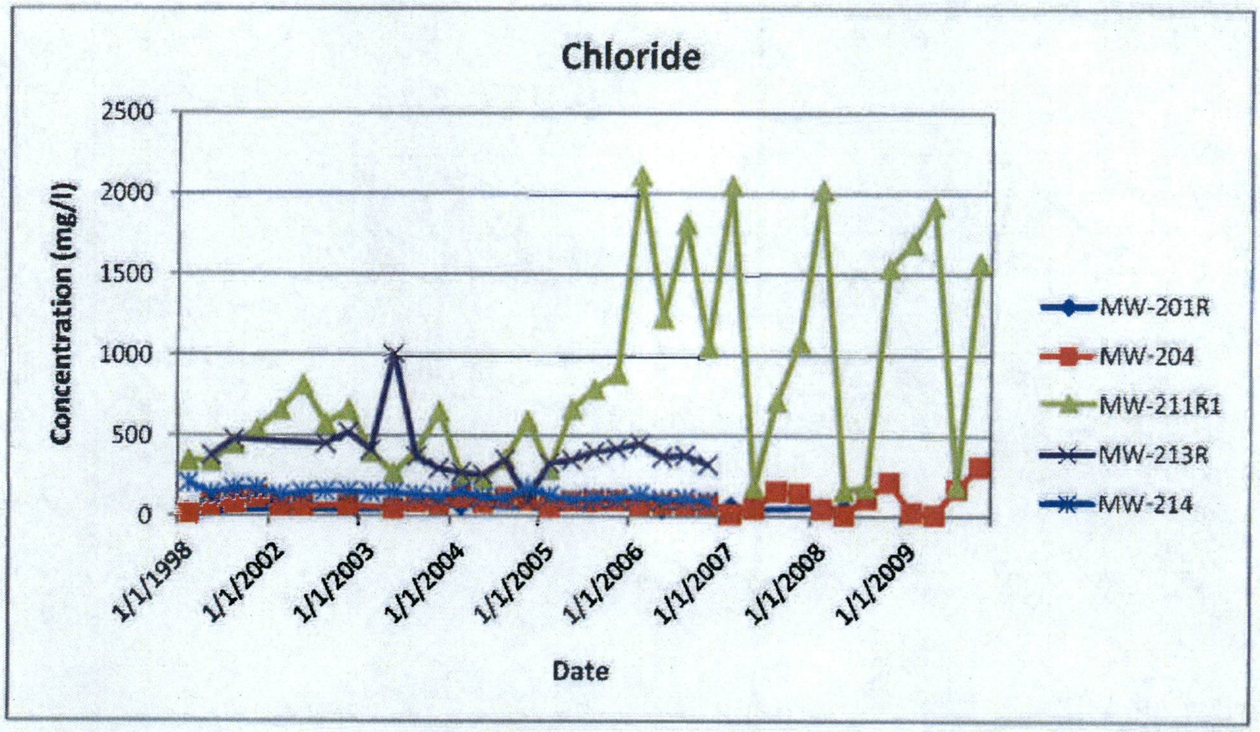


FIGURE 5

KELLY RUN SANITATION, INC
PITTSBURGH COAL
TIME SERIES PLOTS

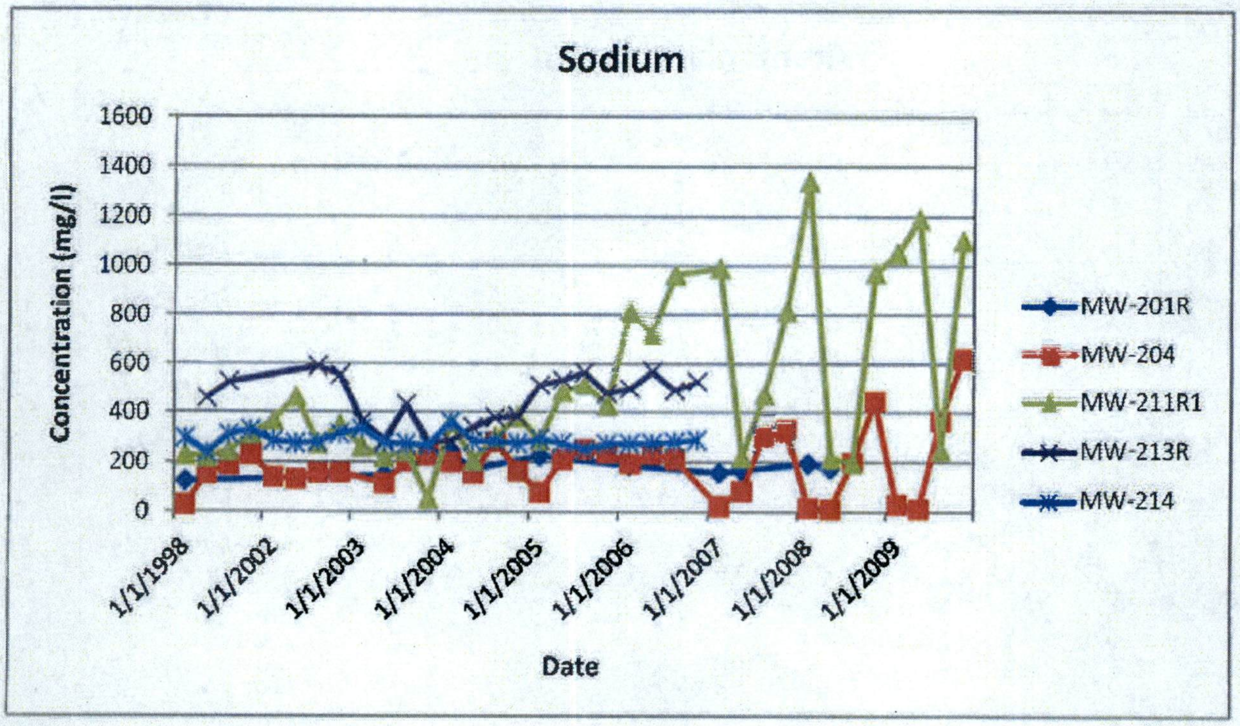
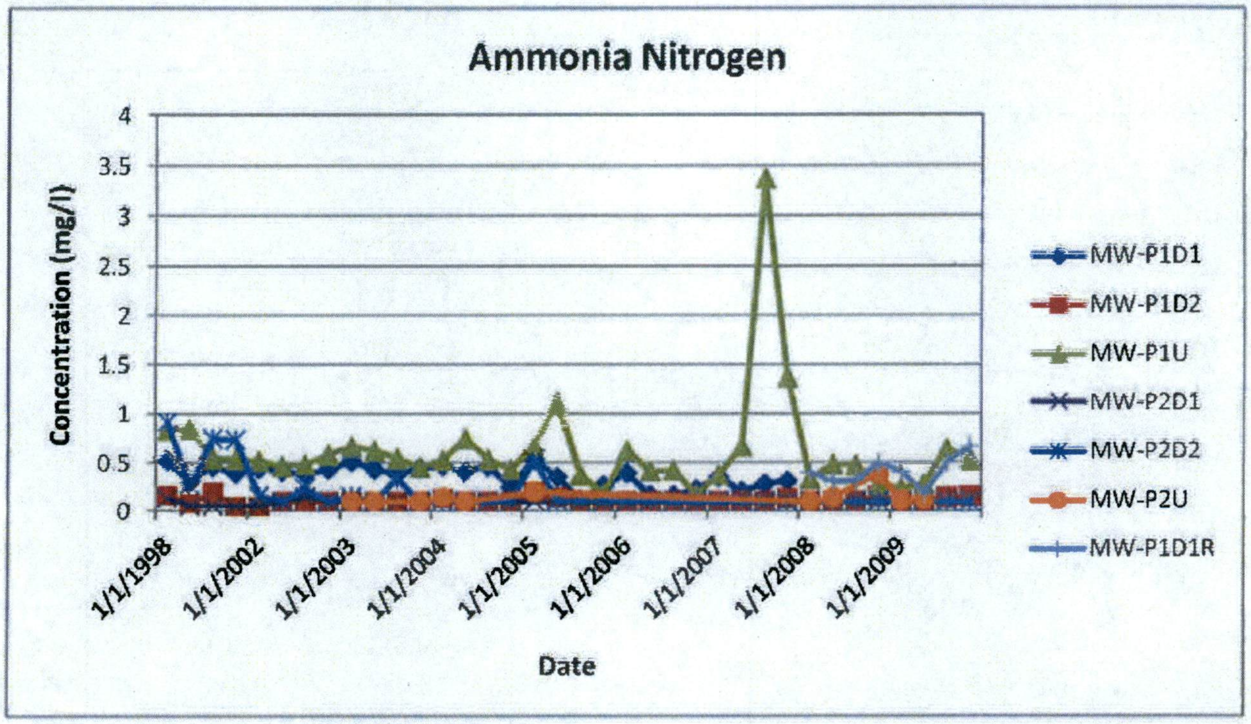


FIGURE 6

KELLY RUN SANITATION, INC
LEACHATE POND
TIME SERIES PLOTS



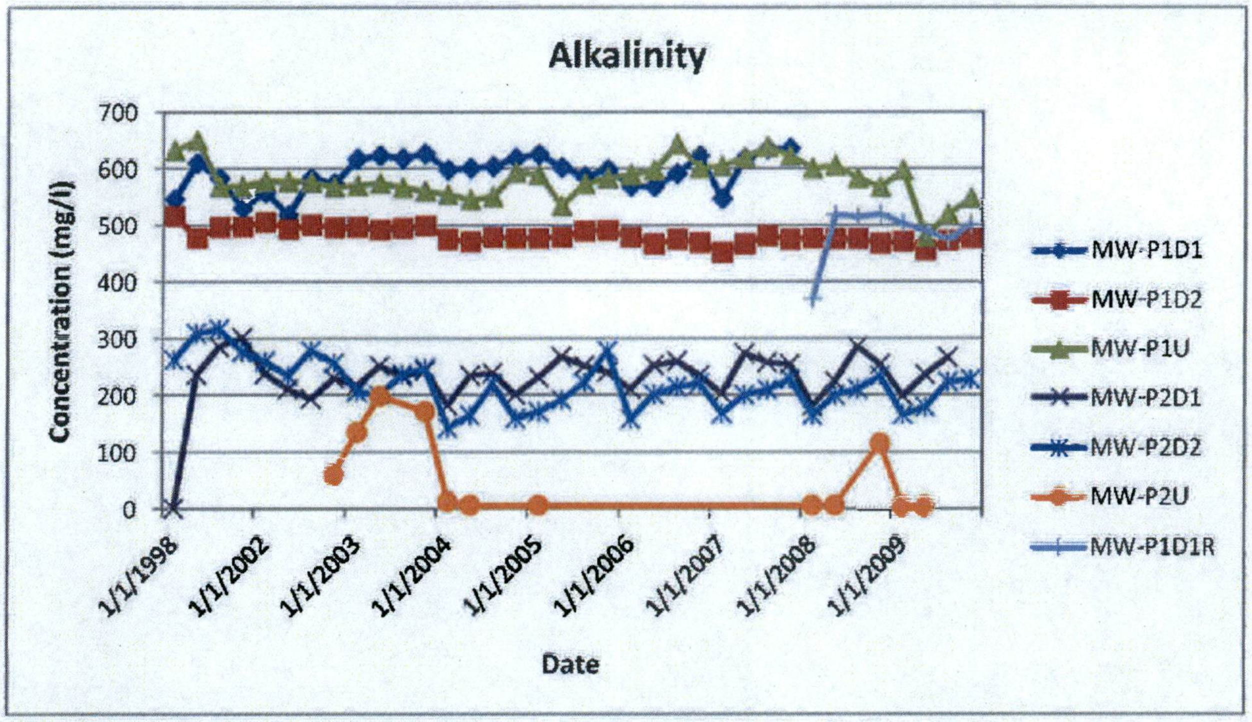
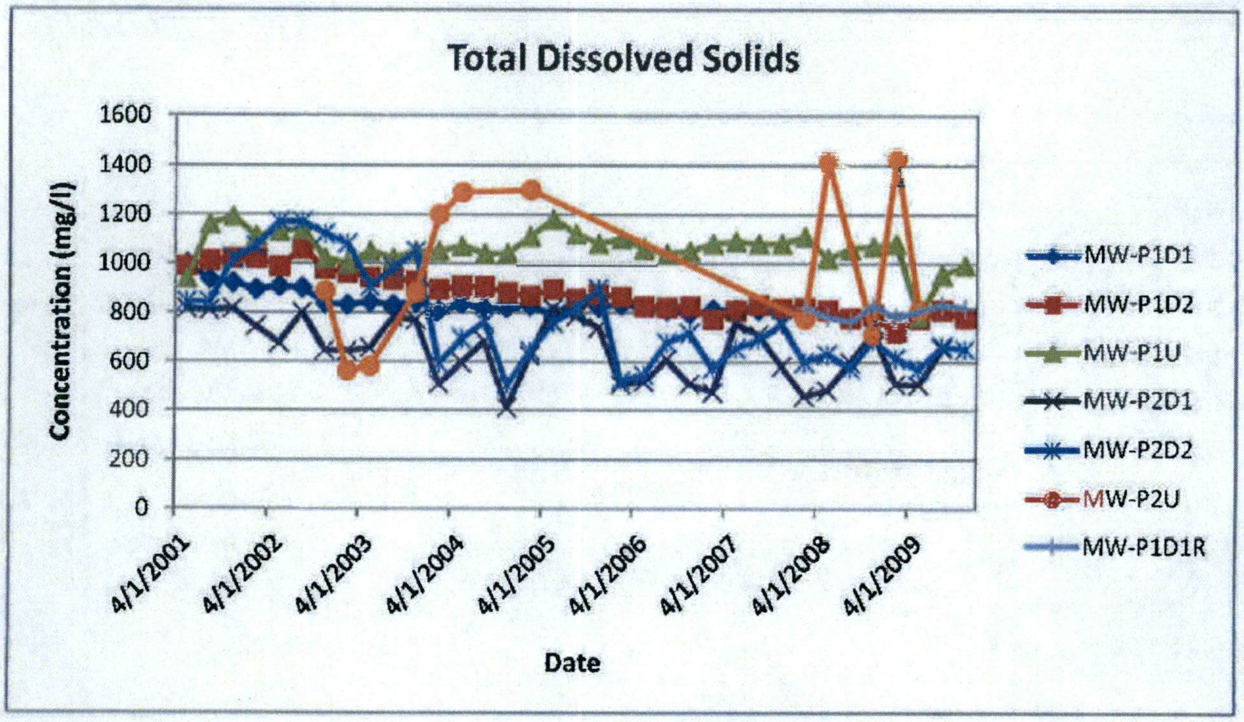


FIGURE 6

KELLY RUN SANITATION, INC
LEACHATE POND
TIME SERIES PLOTS



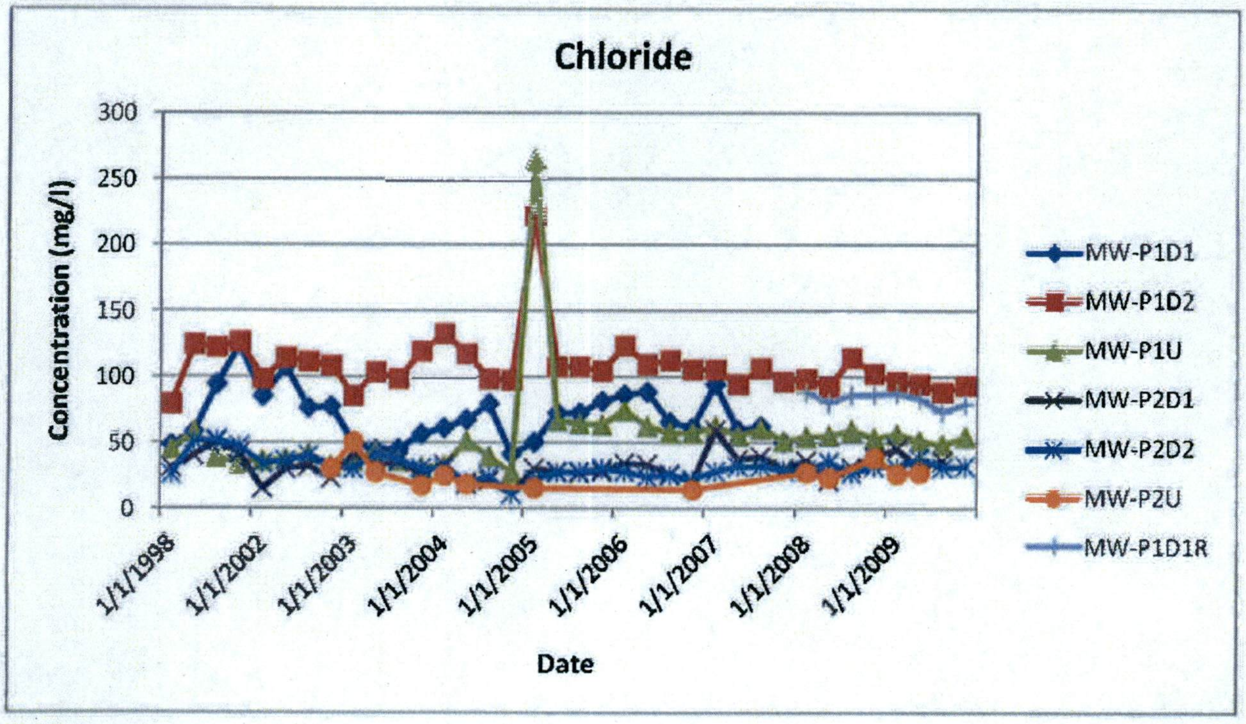


FIGURE 6

KELLY RUN SANITATION, INC
LEACHATE POND
TIME SERIES PLOTS

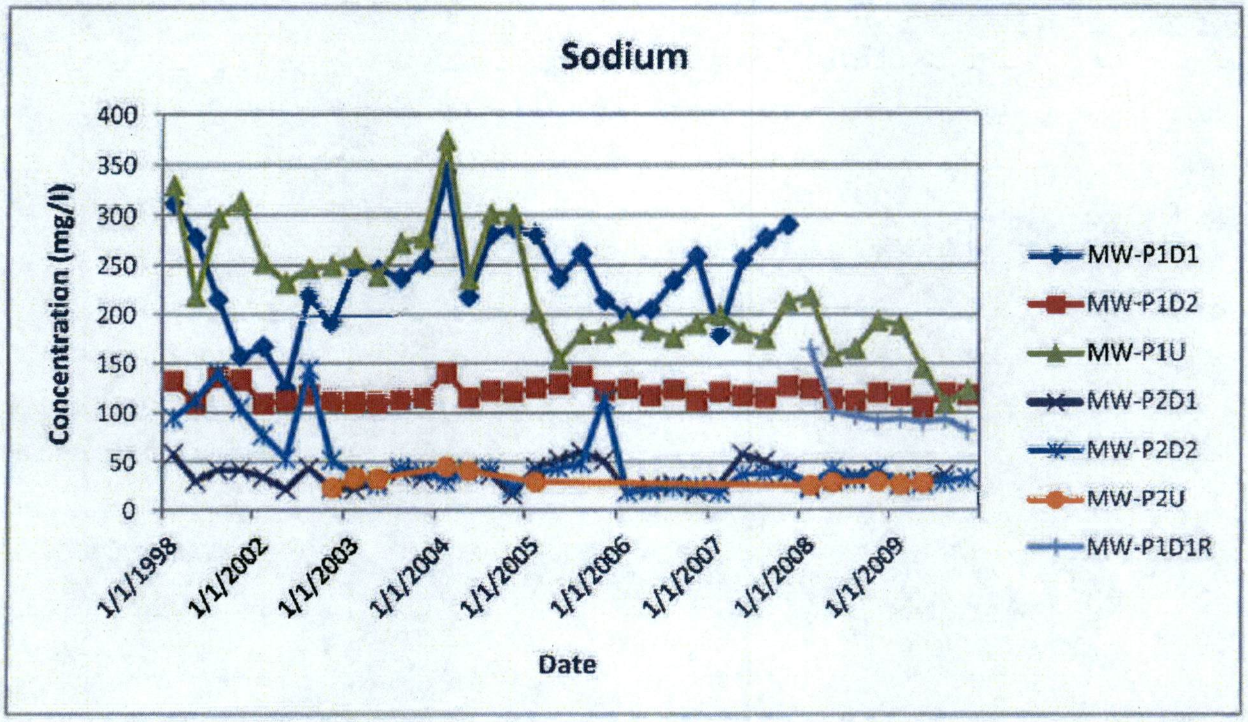


FIGURE 7

TRILINEAR DIAGRAM OF BENWOOD LIMESTONE

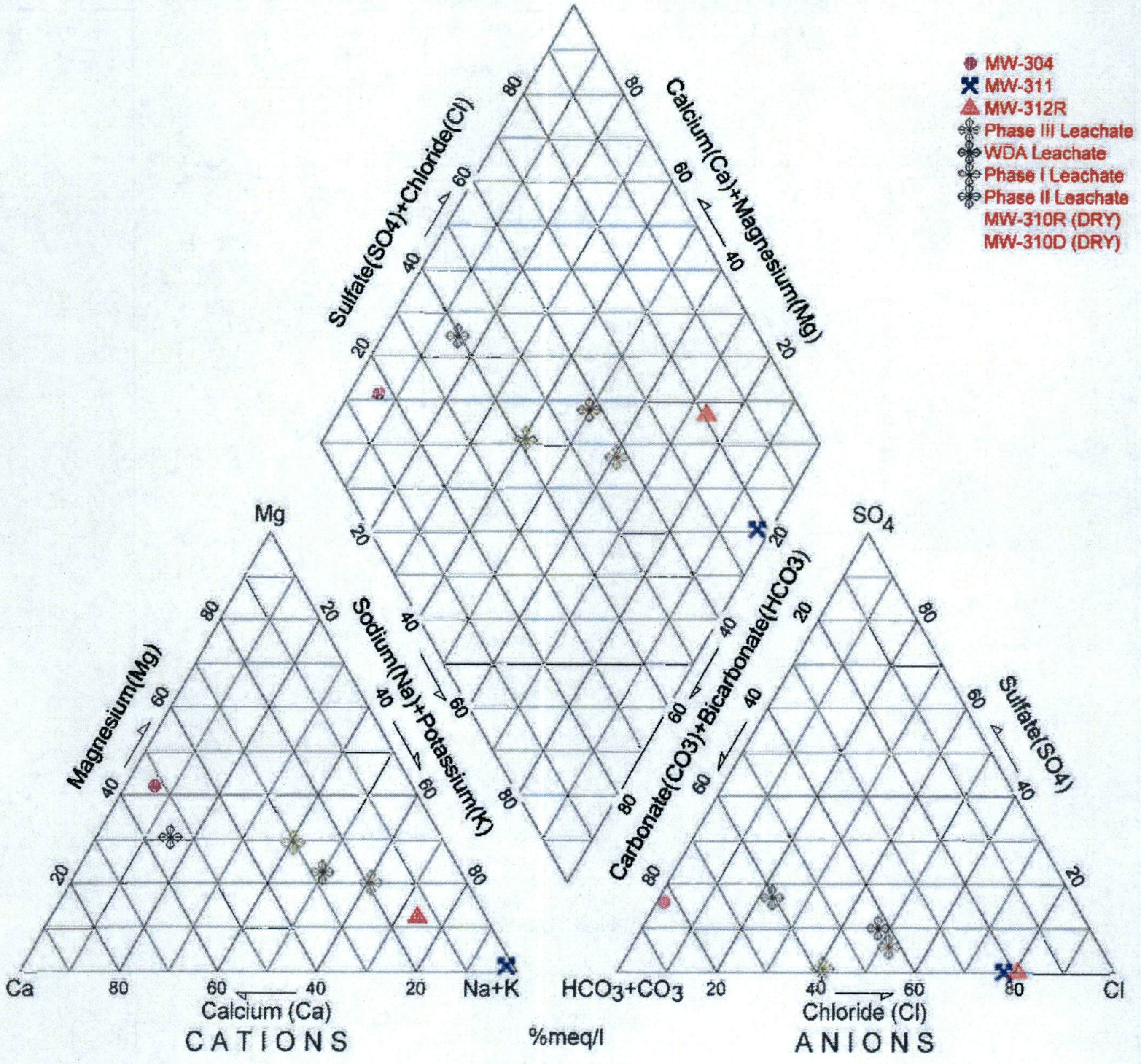


FIGURE 8
STIFF DIAGRAM OF BENWOOD LIMESTONE

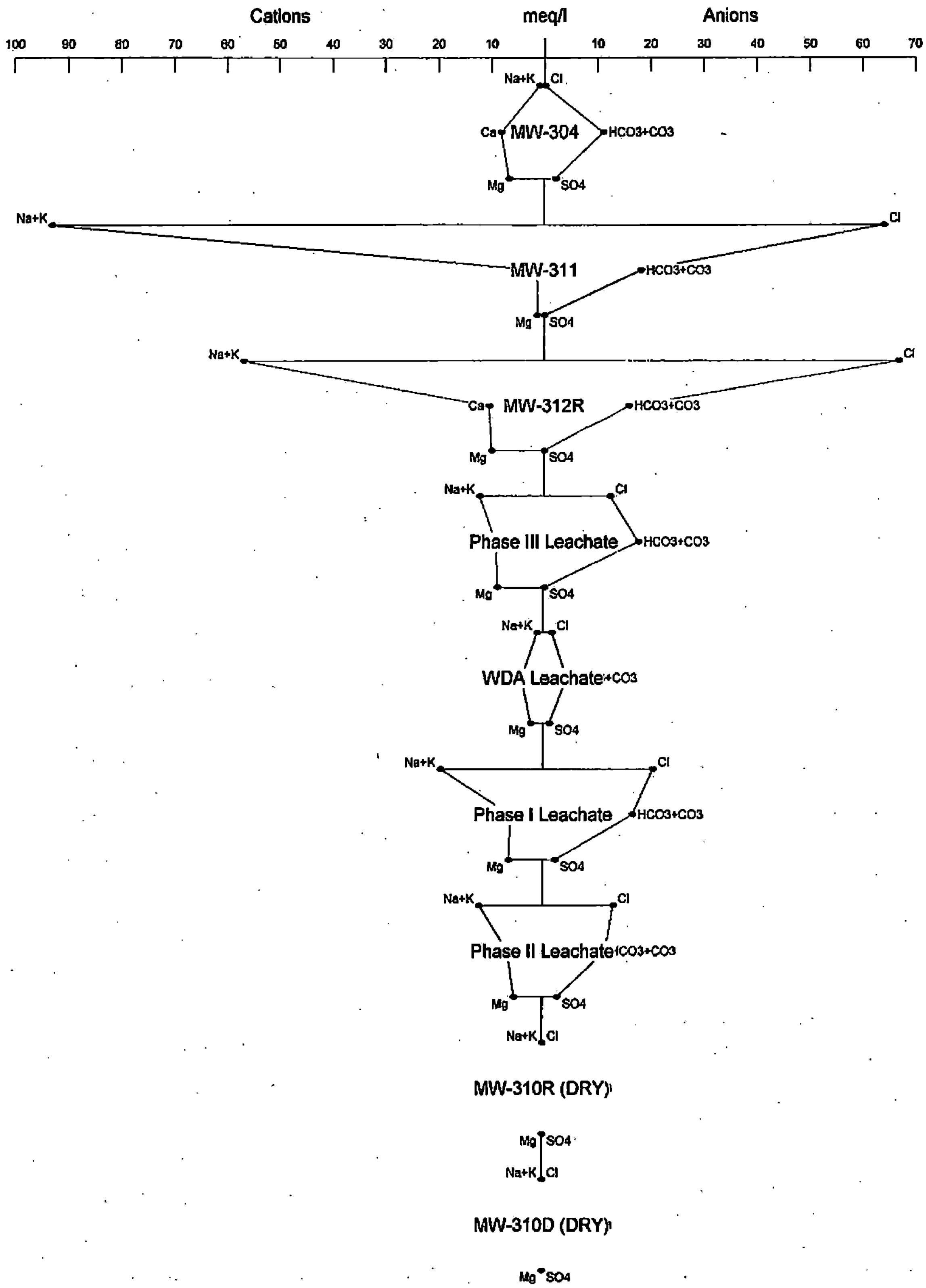


FIGURE 9

TRILINEAR DIAGRAM OF PITTSBURGH COAL

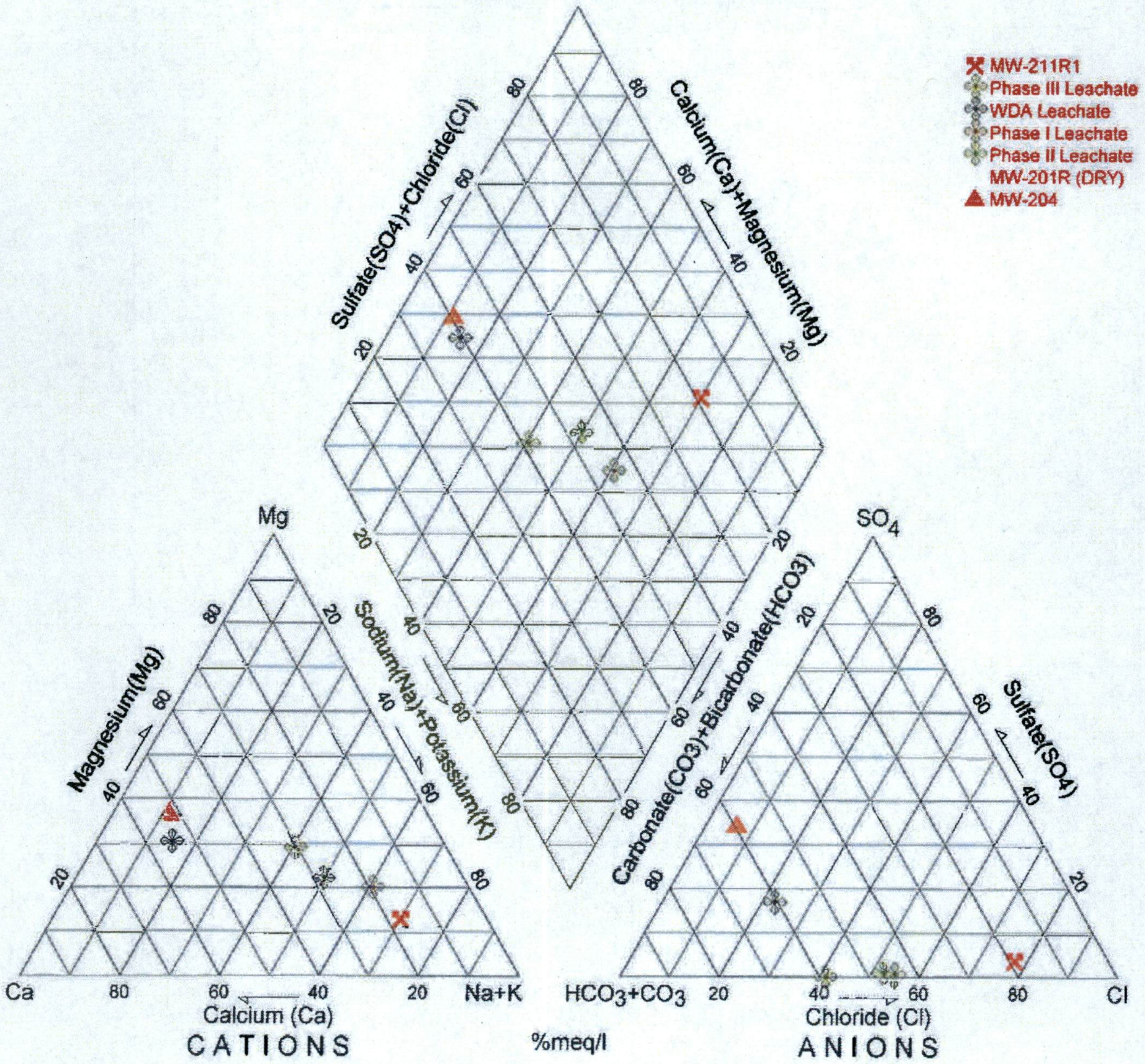


FIGURE 10
STIFF DIAGRAM OF PITTSBURGH COAL

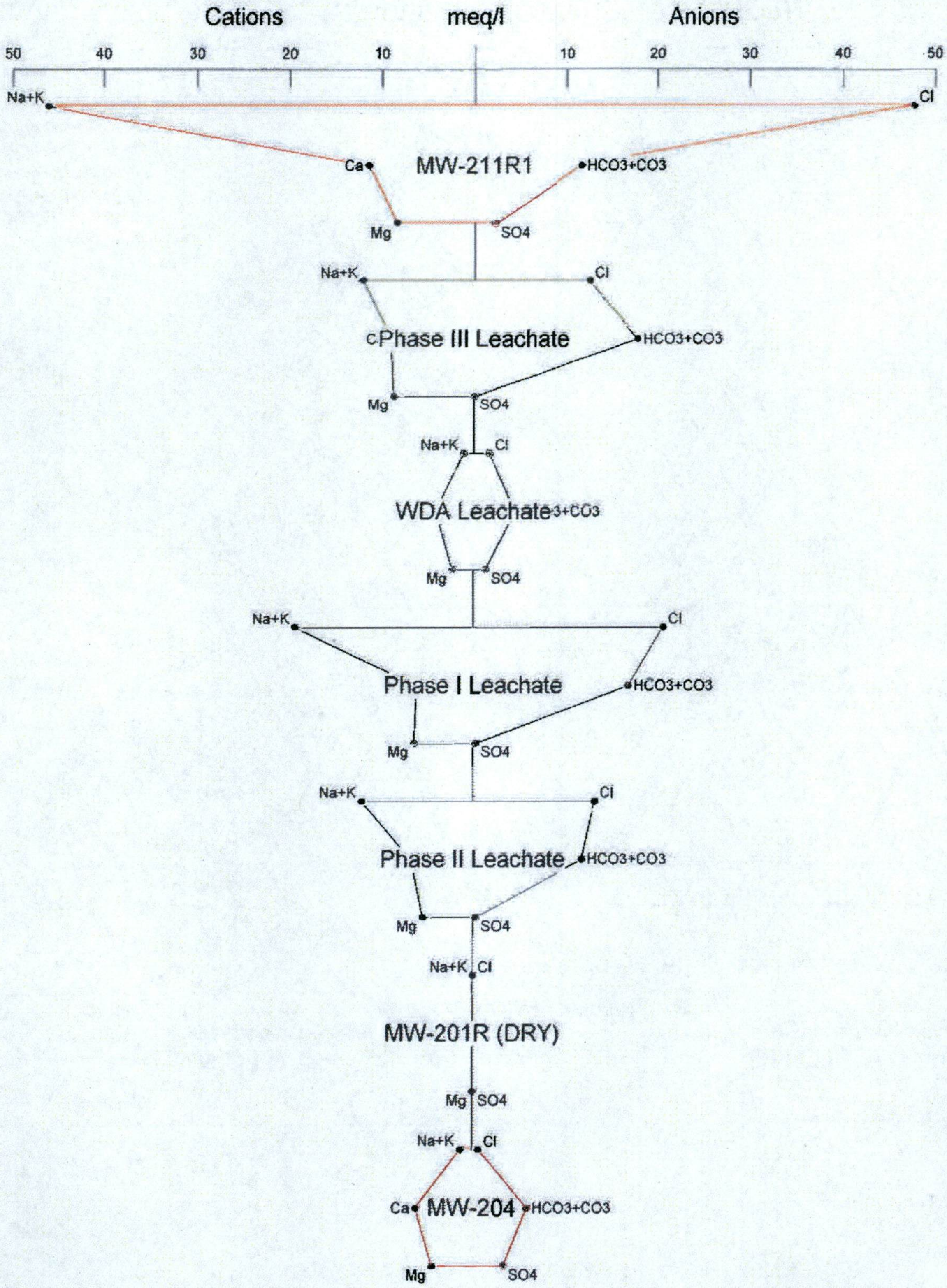


FIGURE 11

TRILINEAR DIAGRAM OF LEACHATE POND NETWORK

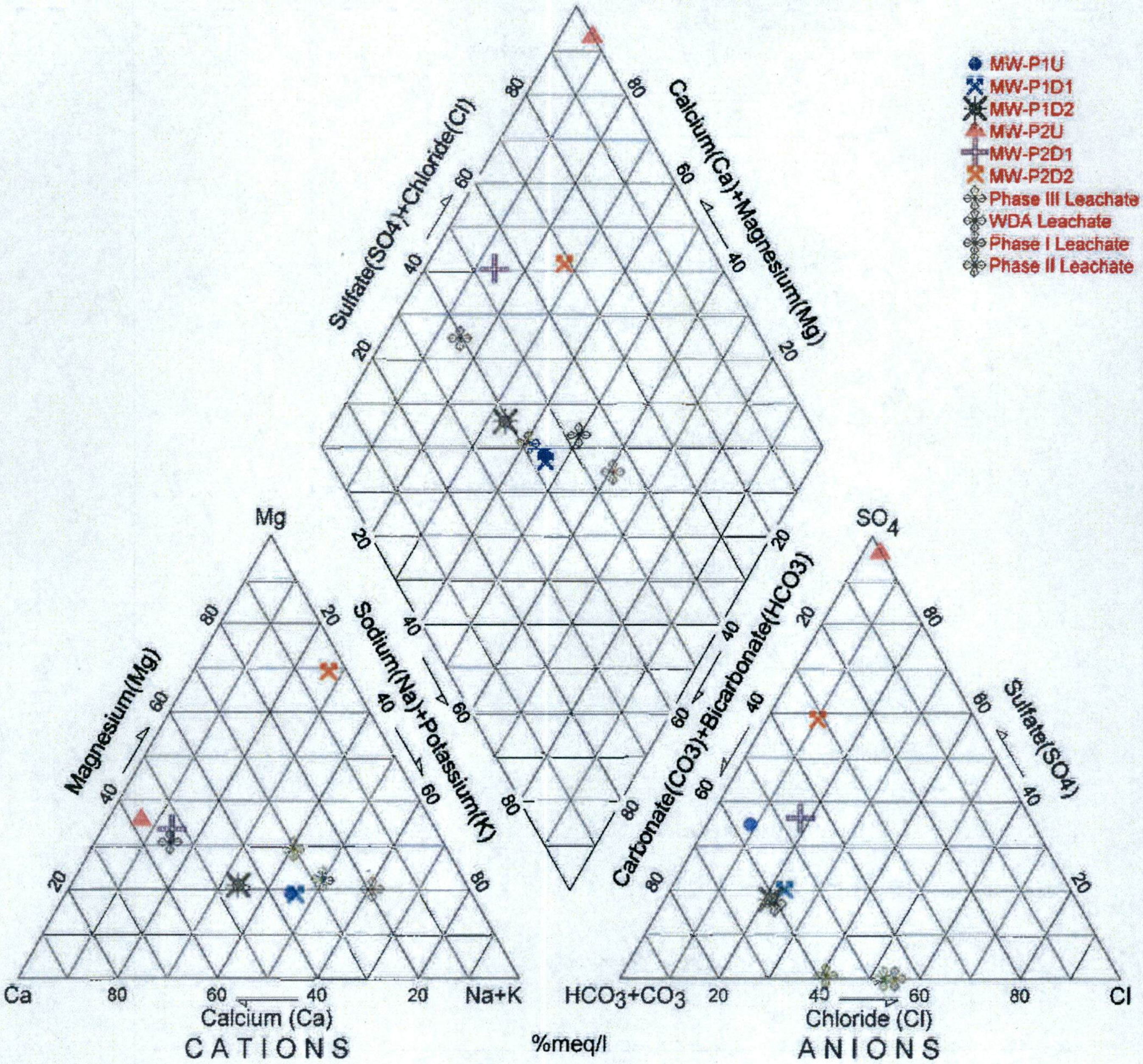
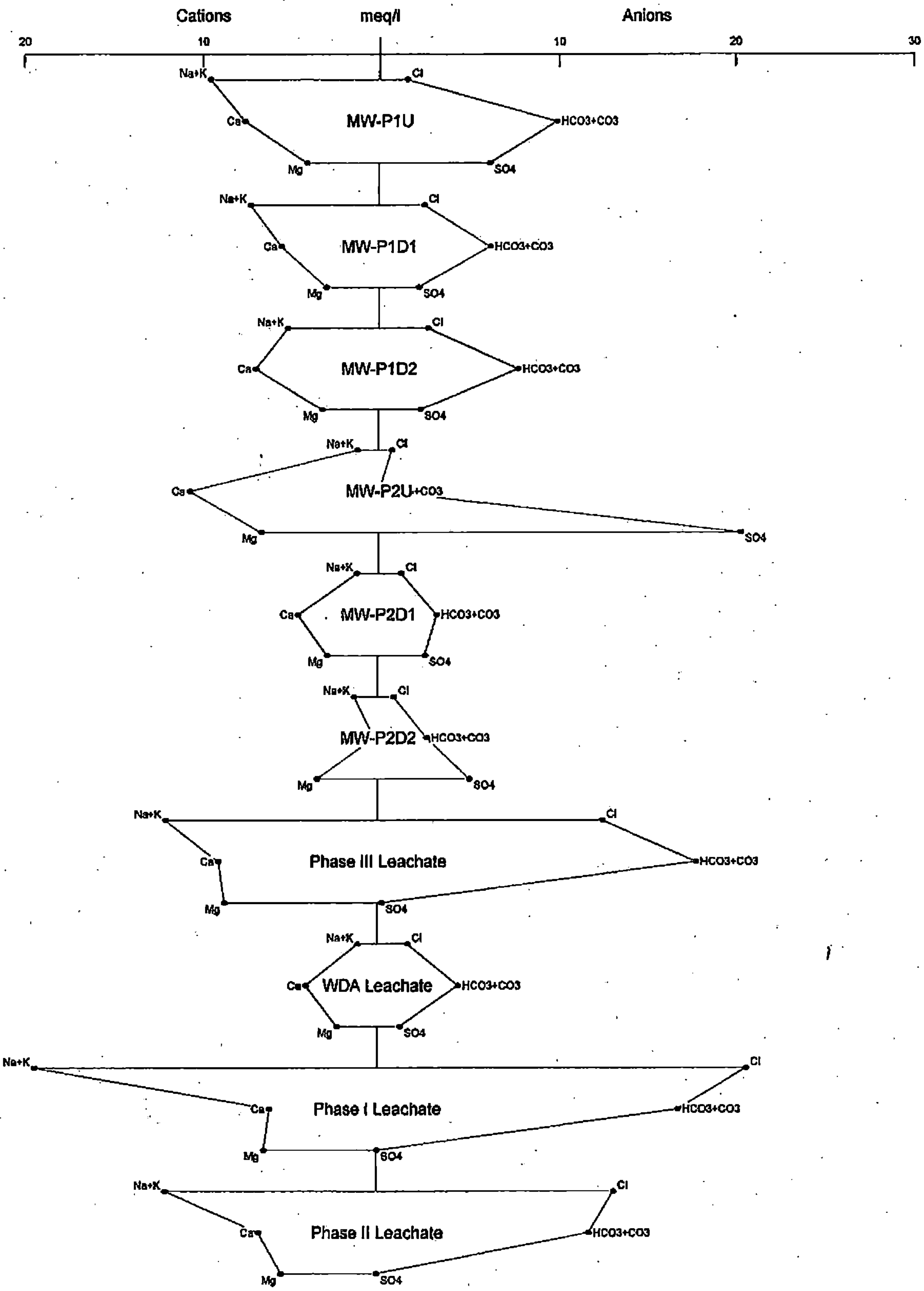
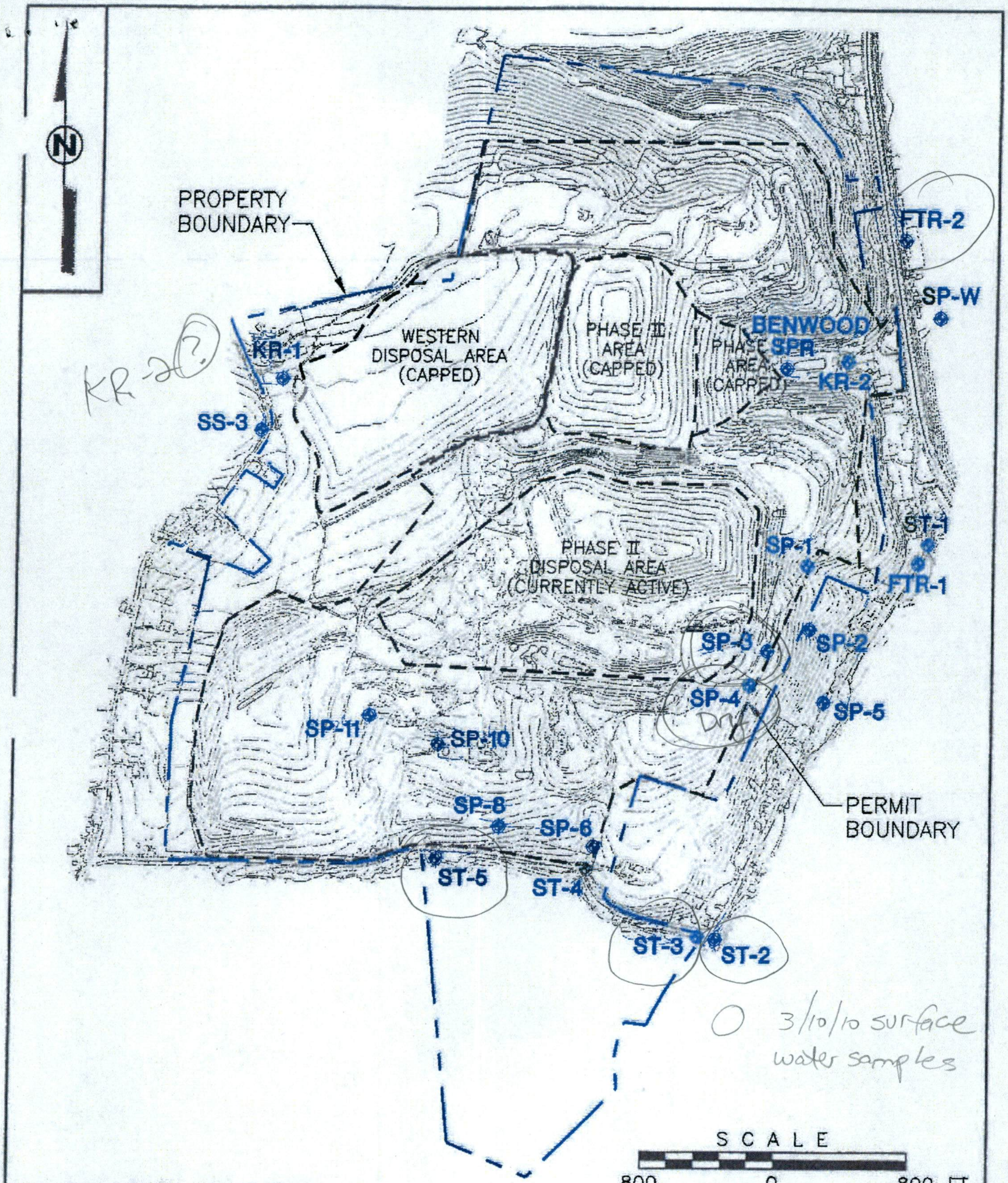


FIGURE 12
STIFF DIAGRAM OF LEACHATE POND NETWORK





CAD: JHG 08/19/05 050558A6.DWG

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SURFACE WATER MONITORING
LOCATION MAP
KELLY RUN LANDFILL
PERMIT NO. 100663

DWN. BY: JHG	SCALE:	DATE:	PROJECT NO.:	
CHKD. BY: RCA	AS SHOWN	08/19/05	050558	FIGURE B-1

APPENDIX A

FORM 19 1ST QUARTER 2009
(SUBMITTED MAY 2009)

APPENDIX B

FORM 19 2ND QUARTER 2009
(SUBMITTED AUGUST 2009)

APPENDIX C

FORM 19 3RD QUARTER 2009
(SUBMITTED NOVEMBER 2009)

APPENDIX D

FORM 19 4TH QUARTER 2009
(SUBMITTED FEBRUARY 2010)